7 FEBRUARY 1958 ONE SHILLING & SIXPENCE

FLIGHT

and
AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

The passenger will decide
—he will choose the jet

The new Comet pays its way on moderate stage-length, moderate traffic —yet its irresistible appeal will ensure high load factors

The New COMET
(Four Rolls-Royce Avon jet engines)

DE HAVILLAND

More hours in the air with

Lockheed
HYDRAULIC PUMPS

Lockheed
HYDRAULIC PUMPS
are specified for

CIVIL AIRCRAFT—

COMET—*all marks*
CARAVELLE
VISCOUNT
VANGUARD
AWA FREIGHTER COACH
HERALD
DART HERALD
TWIN PIONEER
ACCOUNTANT
AGRICOLA

MILITARY AIRCRAFT—

VAMPIRE TRAINER
VENOM
SEA VENOM
GNAT
CANBERRA
VALIANT
FIAT G91
BEVERLEY
COMET 2
PRESTWICK PIONEER
VARSITY
GANNET
FAIREY D.2
FUJI T.1 F.1

6000 HOURS

5000 HOURS

Lockheed
HYDRAULIC AIRCRAFT EQUIPMENT

AUTOMOTIVE PRODUCTS COMPANY LIMITED
LEAMINGTON SPA, WARWICKSHIRE, ENGLAND

The ONLY Hose Unit to meet Air Ministry Spec. D.T.D. 3954

Palmer

You're fitting *the* Ministry-approved hose when you fit Silvoflex, the hose chosen by Rolls-Royce and other leading manufacturers for their engines — it is exclusively used on the Dart, for instance. You can make no choice so good as Silvoflex.

Palmer Aero Products Ltd PENFOLD ST. LONDON N.W.8
AERO COMPONENTS · RAMS · VALVES · SILVOFLEX HOSE · X-RAY INSPECTION SERVICE
51301

A

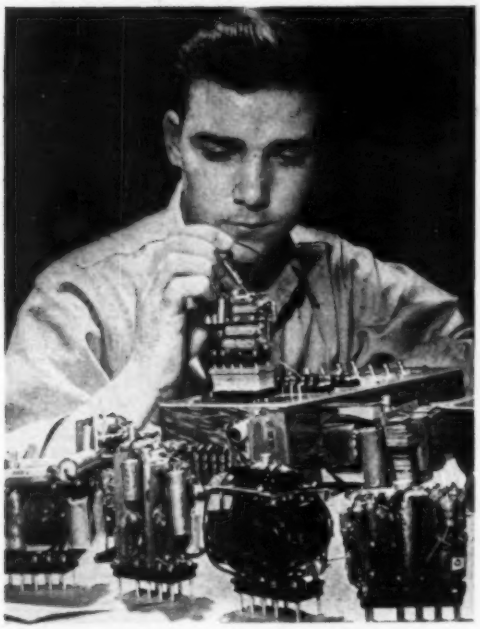
Around the World

J-57 TURBOJETS power the Boeing KC-135 tanker-transport, left, which has shown the potential of the coming generation of large jet airliners by flying 6,350 miles nonstop and without refueling, from the northern U.S. to Buenos Aires. The J-57 jet engines were designed, developed and produced by Pratt & Whitney Aircraft, and are used in many other types of important U.S. military aircraft. JT3 commercial versions of these engines will power the Boeing 720, and many of the Boeing 707 and Douglas DC-8 jet airliners now in production. Other 707s and DC-8s will use Pratt & Whitney Aircraft's JT4 engines, commercial versions of the J-75, most powerful jet engine in quantity production in the free world.

EXPLORING FOR MINERALS is one of many important activities in which helicopters play significant roles. This Sikorsky S-55 carries an electromagnetic detector, a scintillation counter, and a magnetometer. The helicopter can follow closely contours of rough and mountainous terrain in flight patterns that cannot be approached by fixed winged aircraft.

with United Aircraft

AIR-CONDITIONING systems for Convair 880 jet airliners to enter service in 1960 will be made by Hamilton Standard. The cooling unit weighs only 150 pounds yet has a 10-ton output which can be stretched to 12 tons when necessary. By contrast, the air-conditioning unit in one of the latest piston-engine transports weighs over 400 pounds and has only a 7-ton capacity. Each Convair 880 will have two identical systems, operating together or individually. Each is made up of a Freon cooling system, a turbo-compressor, and an electronic temperature control.



ELECTRONIC PRODUCTS are now being designed and manufactured in a separate department at Hamilton Standard. For nearly 40 years the world's leader in propellers, Hamilton Standard ten years ago began a diversification program, specializing in air-conditioning systems, fuel controls, jet engine starter, pumps and valves. These are used in more than 50 types of turbine-powered aircraft and missiles. Now Hamilton Standard is increasing its activity in the electronics field. It will devote its talents to a wide variety of electronic products.

United Aircraft Corporation's manufacturing divisions are the leaders in their chosen fields . . . aircraft engines, propellers and jet aircraft equipment, and helicopters. In commercial and military aviation, products of Pratt & Whitney Aircraft, Hamilton Standard and Sikorsky Aircraft offer advanced design and sound engineering, backed by unsurpassed development, testing, and production facilities.

UNITED AIRCRAFT EXPORT CORPORATION *East Hartford 8, Connecticut, U. S. A.*

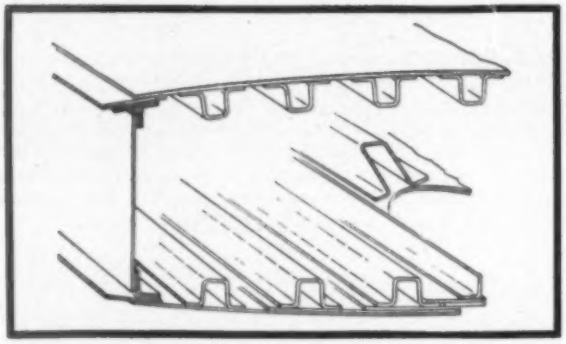
European Offices: 3/5 Warwick House Street, London SW1, England

Sole foreign distributor for:

PRATT & WHITNEY AIRCRAFT *Aircraft Engines*
HAMILTON STANDARD *Propellers and Aircraft Equipment*
SIKORSKY AIRCRAFT *Helicopters*
CANADIAN PRATT & WHITNEY AIRCRAFT CO., LTD. *Aircraft Engines*

Bonds of 'Friendship'

In the construction of the Fokker 'Friendship', the 'Redux' system of metal bonding has been used on an extensive scale. The wings provide a remarkable example of advanced constructional technique; the lower surface of the main outer wing box, for example, with its bonded stiffeners and reinforcing laminations—88 parts in all—is bonded in a single operation. Even the booms of the boundary spars are built up of angle and T-section laminations, bonded together with 'Redux'. The change in section along the span is effected by progressively reducing the number of laminations.



Tests conducted for a period of several years by the Royal Netherlands Aircraft Company Fokker in co-operation with the National Research Laboratory (N.L.L.) have confirmed the superiority of 'Redux' for the bonding of components such as these, where the demands of variable loading and climatic conditions must be fulfilled.

'Redux'

ADHESIVES *for metal aircraft structures*

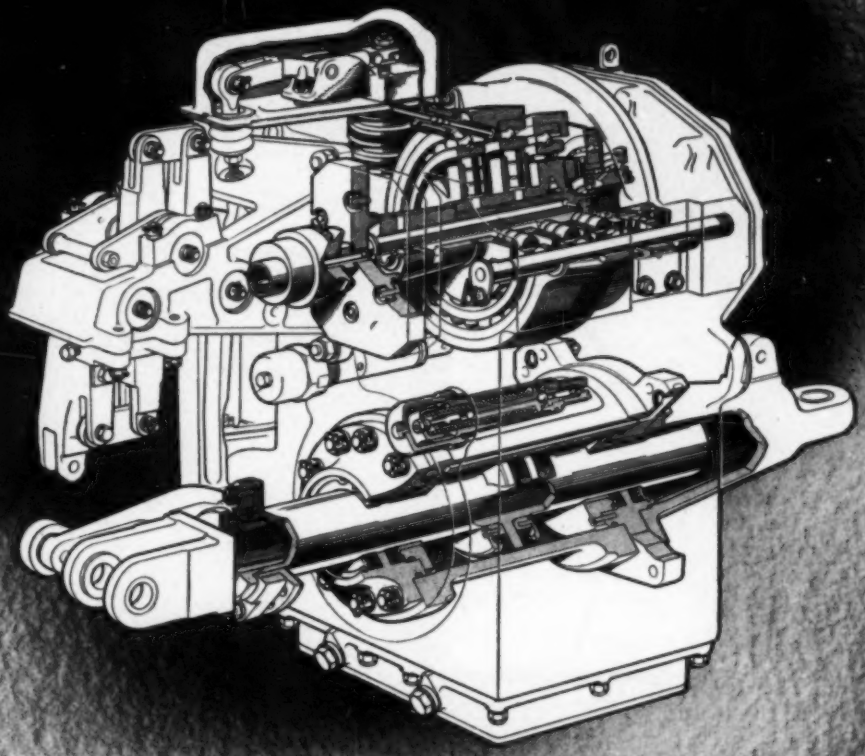
'Redux' is the registered trade name of the adhesive used in the 'Redux' (patented) bonding process.

Aero Research Limited *Duxford · Cambridge · Telephone: Sawston 2121*

SBAC

A.P. 264-230

Power Control



Increasing numbers of modern aircraft incorporate Boulton Paul powered flying controls in their design. Why is this? Because Boulton Paul Power Controls are sensitive, accurate, stable, reliable and safe.

BPA

BOULTON PAUL AIRCRAFT LTD.

WOLVERHAMPTON ENGLAND

J.3472

VIBRATION EQUIPMENT

GOODMANS VG.108 VIBRATION GENERATOR—designed and produced entirely by British Enterprise—the first such equipment available from British sources with peak thrust capabilities over one ton. The VG.108 is suitable for vibration testing complete assemblies of moderate mass to current test specifications, with reserves, in thrust and frequency characteristics, adequate to cope with future extensions of test techniques. Random and environmental waveforms can be applied to the VG.108

The only European Vibration Generator suitable for work on large complete units, GOODMANS VG.109 provides peak thrusts of 8,000 lb. up to 500 c/s. As with the VG.108, this Generator is suitable for use with random or environmental waveforms. For special purpose applications, this model may be suitably modified.

Consult our Technical Advice Bureau if you have any problem concerning vibration.

ENQUIRY FORM

TO GOODMANS INDUSTRIES, LIMITED
AXIOM WORKS · LANCELOT RD. · WEMBLEY · MIDDX. ENGLAND

We are interested in the following:—

- ☐ General Catalogue
- ☐ Equipment to vibrate load of ..... lb at ..... g (..... in) ..... c/s to ..... c/s
- ☐ Suitable driving equipment
- ☐ Other items .....
- ☐ A vibration system for the duty of .....

Name .....

Company .....

Address .....

Please mark details required. F/19

GOODMANS Vibration Generators

GOODMANS INDUSTRIES, LIMITED

AXIOM WORKS · WEMBLEY · MIDDX · ENGLAND
Telephone : WEMbley 1200 (8 lines)

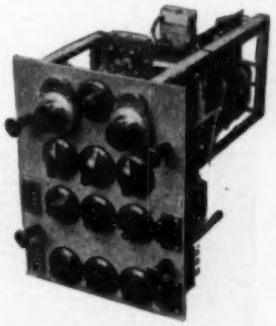
GD.19

Shorts **General Purpose Analogue Computor**

The extended range of non-linear computing units now available increases the versatility of the compact Short Computor. Write for Data Sheets on these units.

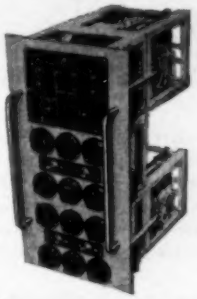
variable time switch unit

This unit permits the solution of problems in which the coefficients are changed from one discrete value to another, either after a given time or when a variable reaches a predetermined value during the period of computation.
The unit will therefore find application to problems in which a simulation is required of transient performance under abruptly changing conditions, or to problems involving integration between two limits.



servo multiplier unit

This unit supplements the HIGH SPEED MULTIPLIER UNIT. It permits four separate variables to be multiplied by one common variable.

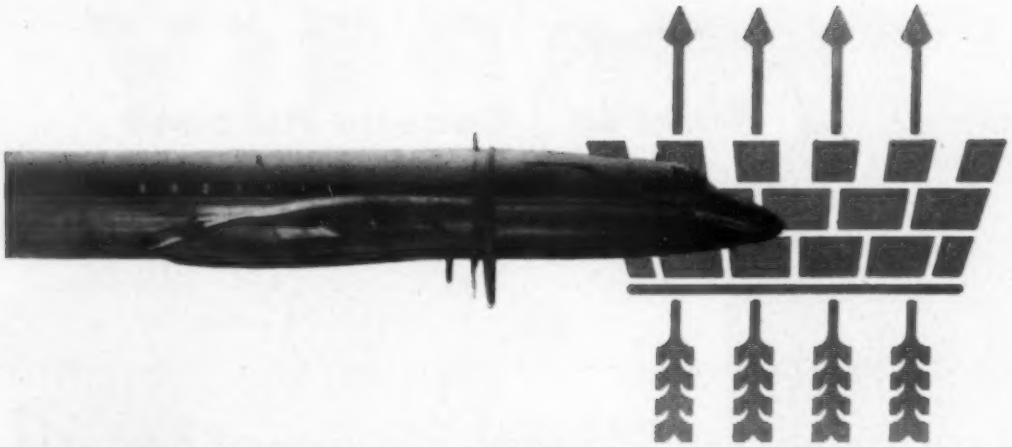


NEW! **another outstanding instrument from the same team**

the low-frequency decade oscillator

This oscillator has been designed for testing servo-mechanisms and electrical systems where inputs of extremely low distortion and accurate amplitude are essential. It employs three drift-corrected computing-type amplifiers to generate a sinusoidal oscillation in the range 0.01 to 110 c/s, according to the setting of the 3-decade frequency control. "Step" and "Ramp" functions may also be generated, and the total distortion is less than 0.5%.

All enquiries to: Short Brothers & Harland Ltd., Computor Sales Department, 208a Regent Street, W.1. REGent 8716



AVIATION DIVISION OF **BIRFIELD INDUSTRIES** LIMITED

...serving the aviation industry

KENT ALLOYS LIMITED
It is true to say that few aircraft flying today do not embody Kent Alloy castings. Current production and development work concerns present and future civil and military aircraft and also contributes extensively to Britain's activities in the guided missiles and electronic fields.

LAYCOCK ENGINEERING LIMITED
The Laycock Company today is an important contributor to most of Britain's aircraft, now flying, or in current production. Laycock Layrub drives and couplings feature variously on many machines such as the S-R Skeeter helicopter, the Bristol Britannia and the Bristol Sycamore helicopter.

HARDY SPICER LIMITED
A name famous throughout the world as synonymous with optimum dependability in transmission equipment. Suppliers of transmission shafts, power take-off drives and flexible disc couplings, Hardy Spicer components contribute to the inherent dependability of many British aircraft now flying or projected.

THE PHOSPHOR BRONZE COMPANY LIMITED
Regular and large-quantity suppliers to the Aviation and allied industries. Castings in all types of Phosphor Bronzes, Aluminium and Manganese Bronzes, Birfield "A" Alloy, "SP" rods and tubes and various other alloys and stainless steels. Current production includes precision castings for guided missiles, jet-engine starters, flight-refuelling equipment, etc.

AVIATION DIVISION OF **BIRFIELD** INDUSTRIES LIMITED · STRATFORD HOUSE · LONDON · W.1

We are permitted to announce that G.Q. recovery parachute systems and air landing cushions are fitted to all De Havilland Spectre and Super Sprite rocket motors.

Both Spectre and Super Sprite will go into service on British V. bombers, and between them provide the World's most economical rocket assistance for take off.

LEADERS IN PARACHUTE DEVELOPMENT

(Including systems for parachuting unstable stores.)

G. Q. PARACHUTE CO. LTD., STADIUM WORKS
WOKING, SURREY **Telephone: WOKING 2277**

B

Have you a problem in VIBRATION?

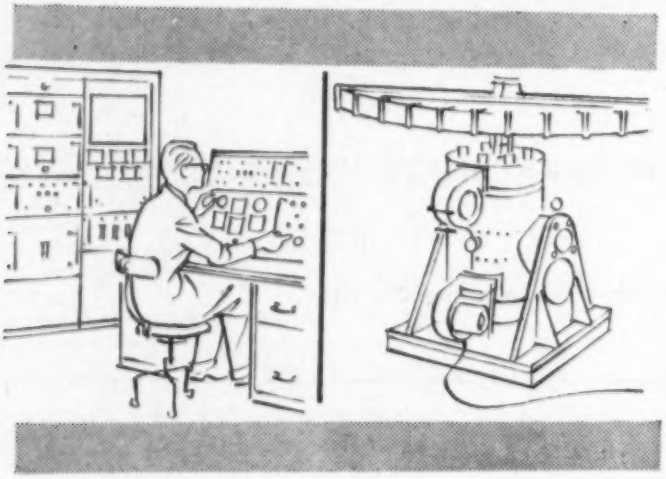
Do you need "shaking up"?—or rather, do any of your equipments need it to test their reactions to continuous vibration? If so, we can help you—vibration equipment design is our business.

Illustrated is a typical model, the EMV 3000, which can be adapted to a wide variety of needs. Peak thrust 3000 lb. Maximum excursion 0.9" P.P. Frequency range 5 c/s-1 kc/s.

A complete installation comprises:—

* *5 kW amplifier* fully balanced and stabilised.
* *Control desk*, with amplifier remote control, six channel monitoring and autostrobe unit.
* *Ancillary equipment* including set of high power stroboscopes.

Available as a complete installation or as individual units.



Whatever your problem in vibration testing, our specialist staff can advise you. Write or telephone to:

EMI ELECTRONICS LTD
INSTRUMENT DIVISION

HAYES · MIDDLESEX Tel: SOUthall 2468 · Exts. 655 and 1071

SE136

THE DE HAVILLAND ENGINE COMPANY LIMITED

Announce the

GNOME

A 1000 horse power gas turbine engine with an exceptionally low weight and fuel consumption

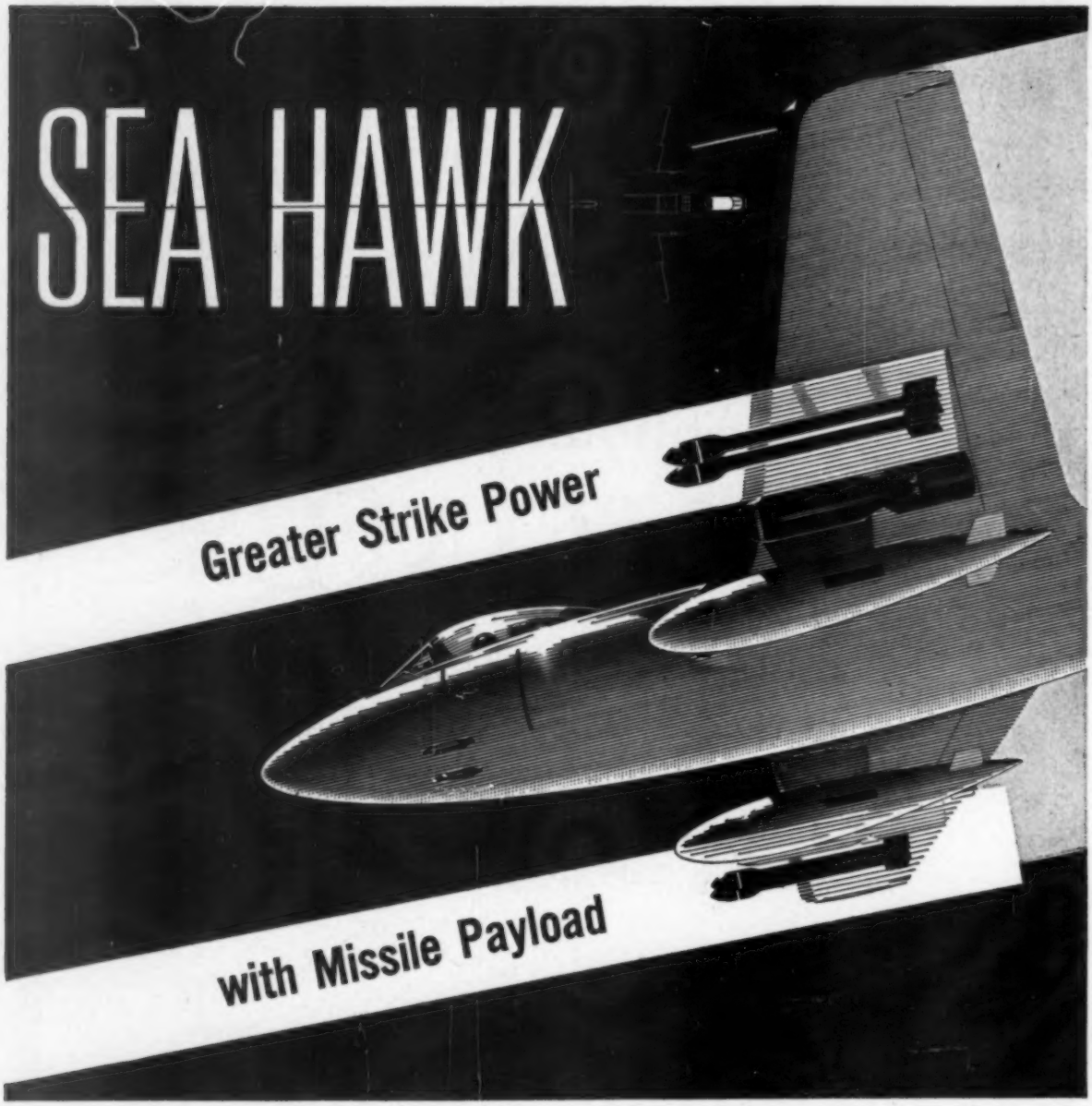
Production is planned to commence in 1959

The Gnome *is the outcome of close technical collaboration between The de Havilland Engine Company and the General Electric Company of America. In its first version it will be a constant-power turboshaft unit for helicopters and this will be followed by a turboprop engine. Both of these are derived from the T58*

*

DE HAVILLAND ENGINES

SEA HAWK



To its increased range and near-sonic speeds the Sea Hawk adds a weightier punch in air attack. It has been fitted to carry bombs, rockets and other under wing stores. Easy to handle and easy to fly, the Sea Hawk is proving itself effective not only in its famous 'carrier-borne' role, but equally as a land-based fighter. It is in squadron service with the Fleet Air Arm, and NATO 'off-shore' orders already total $18,400,000.

GENERAL DATA

Mid-wing monoplane of stressed skin all-metal construction; with tricycle undercarriage. Air-intakes for the single engine are placed in 'nostril' formation at the wing roots. Hawker patented bifurcated outlet trunk enables exhaust to discharge from trailing edge instead of from the fuselage tail end. This gives more room for built-in fuel tanks for greater range. Span — 39 ft. Length — 40 ft. Maximum speed — close to speed of sound. Power — one Rolls-Royce 'Nene' turbo-jet.

SIR W. G. ARMSTRONG WHITWORTH AIRCRAFT LTD

BAGINTON, COVENTRY, ENGLAND

MEMBER OF THE HAWKER SIDDELEY GROUP/PIONEER...AND WORLD LEADER IN AVIATION

FIRST AERONAUTICAL WEEKLY IN THE WORLD FOUNDED 1909

FLIGHT and AIRCRAFT ENGINEER

No 2559 Vol 73 FRIDAY 7 FEBRUARY 1958

Editor-in-Chief
MAURICE A. SMITH D.F.C. AND BAR

Editor
H. F. KING M.B.E.

Technical Editor
W. T. GUNSTON

Production Editor
ROY CASEY

Iliffe and Sons Ltd.
Dorset House
Stamford Street
London, S.E.1
Telephone · Waterloo 3333
Telegrams · Flightpres Sedist London

BRANCH OFFICES

Coventry
8-10 Corporation Street
Telephone · Coventry 5210

Birmingham
King Edward House, New Street, 2
Telephone · Midland 7191 (7 lines)

Manchester
260 Deansgate, 2
Telephone · Blackfriars 4412 (3 lines)
Deansgate 3595 (2 lines)

Glasgow
26B Renfield Street, C.2
Telephone · Central 1265 (2 lines)

New York, N.Y.
Thomas Skinner and Co. (Publishers), Ltd.
111 Broadway, 6
Telephone · Digby 9-1197

ANNUAL SUBSCRIPTION
Home £4 15s 0d, overseas £5 0s 0d. Canada and U.S.A. $15.00.

Second Class Mail privileges authorised at New York, N.Y.

In this issue

166 **Napier Announce Gazelle Junior**
169 **The Nord SS-10 Anti-tank Missile**
172 **Britain's Aircraft Exports**
174 **Parliament Debates Civil Aviation**
175 **Macchi MB.326**
176 **Turboprop Contenders—An Intercontinental Trio**
178 **Spectre A.T.O. Unit**
180 **Cloudscapes**

Obit or Orbit?

THE Government's announced intention "in present financial circumstances" to withdraw its support for development of the Bristol Orion turboprop has cast another shadow of gloom and doubt over the industry, and has brought new maledictions upon the heads of those who have to make such decisions (though the Ministry of Supply "remains fully convinced of the intrinsic merits of the engine"). Following so shortly after the Minister's affirmation that he was a firm believer in research and development and that he would deprecate very strongly indiscriminate cutting and slashing, the blow stung especially hard—and even harder when it was realized that the decision had placed Canadair (who were committed to the Orion for their CL-44 transport) in a very awkward predicament indeed. There was strong feeling that the Government had acted in bad faith; yet this could hardly be substantiated, for the reason that the Minister's pronouncement related specifically to *military* research and development, whereas the Orion had won its sponsorship largely on the strength of a B.O.A.C. requirement.

Bristol themselves had contributed very substantially to the financing of the programme, and there is much sympathy for their not feeling justified, "in the present general uncertainty about long-term requirements for long-range aircraft in this country," in continuing development on their own account.

The situation that now arises is that the Britannia programme will be harnessed to a developed version of the Proteus (the present airframe could not, in any case, have derived full benefit from the Orion's unique qualities), and that later and larger derivatives of that excellent aeroplane—undertaken, perhaps, by Shorts—will be dependent on some other powerplant.

We are left with the hope that Bristol will, in fact, mothball the Orion (this now being a recognized British development procedure) and that, Government support or no, Orion's belt will yet encircle the world in challenge to the mighty Tu-114.

Luftwaffe—Test Case

GERMANY—hard up against the Iron Curtain, a partner in NATO, and a State which, with a fast-expanding economy, is building up armed forces more or less from scratch—is in need of an air-defence weapon-system; and her case presents one of the most interesting tactical and strategic problems since World War 2.

From the moment Germany regained her sovereignty and became the biggest potential market for weapons since World War 2 all the brochures in the free world have been pushed on the desks of her Defence Ministry. Hardware, theories and concepts have been offered at cost price, cut-price, second-hand and first-hand.

The German forces must be well equipped: being committed to NATO they would certainly become quickly involved in any major European upheaval. Already they have been treated to the most comprehensive briefing on air-defence techniques yet delivered to any country. From Britain, France and the U.S.A. designs, philosophies and concepts have come pouring in; and the Luftwaffe chiefs must by now have heard enough to enable them to distinguish between a merely bright idea and a thoroughly sound one. It now appears that for their advanced defence requirements (beyond the intercepter soon to be chosen) they are willing to listen to any proposal, but are not yet prepared to commit themselves to any one system.

Sooner or later they will make a decision. They will pick one product from one country, or a combination from several countries; and they will adopt a pattern of defence, whether it be purely home defence or a complex of deterrent and defence. If their decision is made on strategic grounds alone, it will set the pattern of defence for any similarly placed country in the world. Manned or unmanned, programmed or directed, deterrent or defensive, that weapon system will be the best procurable—subject only, perhaps, to political considerations.

FROM ALL QUARTERS

U.S. Satellite Launched

THE successful launching of the world's third artificial Earth satellite took place at Cape Canaveral, Florida, at 10.55 p.m. on Friday, January 31. The satellite was the U.S. Army's Explorer, launched by means of a modified Jupiter C rocket vehicle. Weighing 30.8 lb and containing instruments and radio transmitters, Explorer was reported to have an initial orbit, inclined at 35 deg to the Equator, which reached an apogee of 1,700 miles and a perigee of 200 miles. The time taken per orbit is 114 minutes.

Leader of the U.S. Army team which has developed the satellite is Dr. Wernher von Braun, creator of the wartime German V-2 and now director of development operations of the Army Ballistic Missile Agency at Redstone Arsenal. Jupiter C normally consists of a Redstone liquid-propellant first stage, four Recruit solid-propellant rockets forming a second stage, and a fifth Recruit acting as a third stage. Dr. von Braun has stated that the vehicle used to launch Explorer comprised four stages, and that the main Redstone section featured increased tankage and employed a new fuel known as Hidyne, giving it a thrust of 78,000 lb.

The satellite is cylindrical in shape, with a bullet-shaped nose cone, and measures 80 inches in length (including final-stage rocket) and six inches in diameter. Its instruments include a Geiger counter to register cosmic rays, external and internal temperature gauges, impact microphones and erosion gauges to register micrometeorites, and two radio transmitters which are operating respectively on 108 Mc/s at 60 mW and 108.3 Mc/s at 10 mW. The satellite will not be visible from Britain, although its radio signals may be received here.

The Minitrack reporting network intended for use with the U.S. Navy's Vanguard satellite project is being used to collect and process the information which Explorer is providing. Preparations for the launching of Vanguard are continuing, and officials at Cape Canaveral have said that a second Army satellite is to be launched before April.

Dr. Richard Porter, chairman of the U.S. technical committee for the I.G.Y. satellite programme, announced the successful launching (on behalf of the National Academy of Sciences and the National Science Foundation) in Washington early on Saturday, February 1. The information gained, he said, would be shared with all nations participating in the I.G.Y. activities.

Swiss Hunter Order Approved

AFTER several months of doubt and conflicting rumours, the proposed Swiss order for 100 Hawker Hunters has received official approval. On January 29 the National Council—the Lower House of the Swiss Federal Parliament—voted in favour of the purchase, which had been approved by the Upper House in December. The voting was 123 in favour and 11 against, with a number of Members abstaining. The vote authorizes the expenditure of 313m Swiss francs (about £26m) on 200 military aircraft, about half of which sum will be for the purchase of 100 Hunters. Though Hawker Aircraft have made no formal announcement, it is understood that the contract has since been signed.

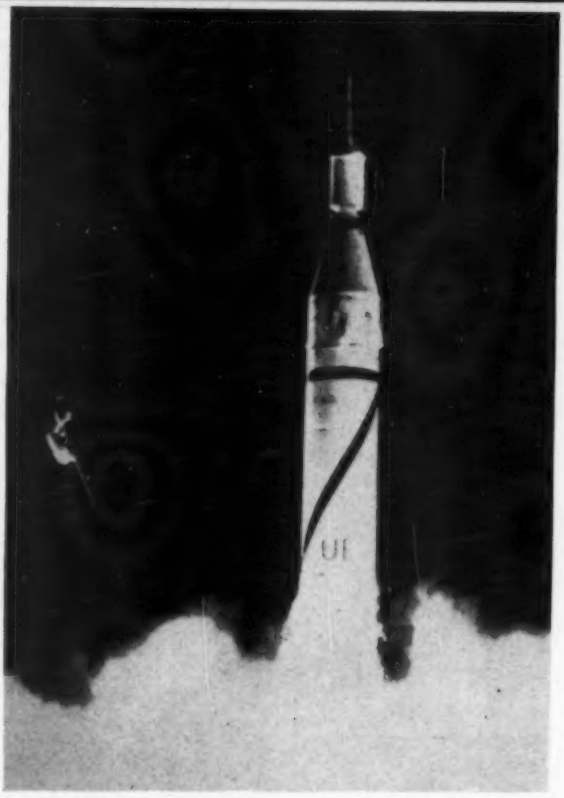
Whether the remainder of the £26m will also be spent on Hunters is not yet known; there has been keen competition from U.S., Canadian and French manufacturers, and a native product, the Swiss P.16, had also been under consideration.

With the Hunter orders already in hand—notably the contract with India, valued at between £20m and £30m—the Hawker factories now face a very much brighter future than they did when the British defence cuts were announced last year; and Rolls-Royce, as the makers of the Avon engines, also have reason for jubilation. The 100 Mk 6 Hunters, due for delivery by the end of next year, will replace the obsolescent Vampires and Venoms of the Swiss Air Force.

Nuclear-Powered Princesses?

RUMOURS that the Princess flying-boats may find employment as flying test-beds for American nuclear powerplants were largely confirmed last week-end, when it was disclosed that a team from Saunders-Roe, headed by Capt. E. D. Clarke, vice-chairman and managing director, is to visit Washington this month to discuss the possibility. Capt. Clarke said that the Americans [particularly, we believe, the U.S. Navy—Ed.] were at present studying information already sent to them. He did not know whether, assuming their decision was favourable, they would want one, two or three of the aircraft. Saunders-Roe could work on two of them simultaneously in order to bring them up to the required standard.

The three 345,000 lb flying-boats have been Cocooned for the past three years, two at Calshot and one on a slipway in the Isle of Wight. Only one of them had engines installed—ten Bristol Proteus 600s—and took the air, the others being left incomplete.



SPACE EXPLORER: From Cape Canaveral the U.S. Army's Jupiter C rocket blasts off to launch the United States' first Earth satellite. The object on the left is an inspection ladder, swung clear.

Fairey Director's Retirement

AS we go to press we learn with regret that Mr. L. Massey Hilton, D.F.C., A.F.C., A.F.R.Ae.S., has retired from the Board of the Fairey Aviation Co., Ltd. His retirement, at the comparatively early age of 58, was on medical advice. Mr. Massey Hilton joined the company in 1931 after distinguished service in the R.N.A.S. and R.A.F., during which he did much experimental flying in the early development stages of aircraft-carrier operation.

P.1B Performance

SIGNIFICANT details of a recent test flight by a P.1B have been released by English Electric. Flown by chief test pilot R. P. Beamont, the aircraft was airborne from Boscombe Down for 30 min, 23 min of which were flown continuously at supersonic speed. Passing Mach 1 one minute after take-off, it arrived overhead at the makers' airfield at Warton, Lancs, 19 min later. The distance covered was approximately 180 n.m., which gives a mean groundspeed of 652 m.p.h., and an airspeed of some 732 m.p.h. allowing for the 80 m.p.h. head-wind. On reaching Warton, Beamont remained airborne and carried out a series of high-speed tests with the P.1B's two Avons on reheat.

D.H. Nucleonics

IT is announced by the de Havilland Engine Co. that since early 1954 their technical staff have been working in collaboration with the A.E.R.E., Harwell, and that the company have now established a Nuclear Power Group interested in several fields of nuclear power production and application. Chief executive of the group is Prof. A. D. Baxter, and one of its most important current contracts is the design and manufacture of a new type of closed-circuit experimental loop for testing a new pattern of fuel element at unusually high reactor temperatures.

Orion Discontinued

ON January 30 Bristol Aero-Engines, Ltd., announced that they had been informed by the Ministry of Supply that "though the Ministry remains fully convinced of the intrinsic merits of the engine" it was the Government's intention "in present financial circumstances" to discontinue support for the development of the Orion turboprop. The company state that they have "already gone a long way in contributing to the financing of the development programme" and do not "feel justified, in the present general uncertainty about long-term requirements for long-range aircraft

FISHBED B is the NATO designation of this Soviet supersonic interceptor. It differs from Fishbed A (both designs are attributed to Sukhoi) in having blunter wing-tips and a centre-body intake. Note the three boundary-layer fences on each wing.

in this country, in carrying on the development of the engine entirely on its own account."

The Orion is unique in that, although potentially capable of over 8,000 s.h.p., fuel feed is restricted to maintain a constant power of more than 5,000 e.h.p. (approximately 4,400 s.h.p.) up to between 12,000 and 20,000ft. Originally named B.E.25, the engine first ran on December 10, 1955, and at the end of last year had accumulated 2,500 hr running, including 240 hr in flight. Its only definite application was in the Canadair CL-44 transport, and Bristol are holding discussions with the Canadian company "with a view to finding an alternative acceptable solution." The engine was fully described in our issue of October 26, 1956.

Third SeaMaster on Flight Test

THE first of six pre-production Martin YP6M-1 SeaMasters recently began flight testing. A completely new powered-control system has been incorporated following the loss of the first two prototypes; and an enlarged "acorn" fairing distinguishes the tailplane/fin junction. The intakes are aligned normally to the engine axes; and the engines themselves have been sharply toed-out. Intake efficiency is thus improved and the heat of the take-off afterburners of the four Allison J71s is kept clear of the hull.

The 18 production P6M-2s so far ordered will be powered by P. and W. J75s and will be fitted for minelaying and photography, though an anti-submarine strike version has also been mentioned. Special support boats for SeaMaster servicing have been designed by Martin and will be fitted with Solar Jupiter gas turbines providing 160 lb/min of compressed air for starting and air-conditioning as well as 28V D.C. and 400 c/s A.C. current.

New A.S. Test Centre

THE new gas turbine and rocket-motor development centre established by Armstrong Siddeley Motors at Ansty, Coventry, was inspected last week by Mr. Aubrey Jones, Minister of Supply. Accompanied by Mr. H. T. Chapman (managing director) and other senior executives, the Minister toured the 300-acre site on which the facility has been built at a cost of some £2m from the company's own resources.

Buildings include an administrative block; chemical, electronic and hydraulic laboratories and workshops; and gas turbine and rocket test-houses. Among the last-named is a vertical-firing test-bed with an observation room in which, protected by 2ft-thick concrete walls, observers will be able to watch the tests by means of closed-circuit television. Though little can be done to silence the loud but brief runs of rocket-motors, the more prolonged noise of gas-turbine testing will be subdued by Detuner silencing.

Designed by Armstrong Siddeley's own architects, the buildings were erected by another member of the Hawker Siddeley Group, the Kelvin Construction Co., Ltd., while Hawksley S.M.D., Ltd., designed and fabricated the curtain walling from aluminium sheet and extrusions manufactured by High Duty Alloys, Ltd., both these firms also being H.S.G. members.

D.H. to Make the T58

OUR issue of January 17 contained an article describing the General Electric T58 turboshaft engine. This powerplant is the subject of the following statement, made at the beginning of this month by D.H. Engines:—

"The de Havilland Engine Co. announce an important extension of the long-standing agreement for the interchange of technical information which has been in operation between themselves and the General Electric Co. of America since 1951. During this period of close and mutually beneficial technical co-operation the General Electric Co. has been developing a 1,000 h.p. gas turbine engine and the de Havilland Engine Co. have been granted the right to manufacture this important new powerplant in England.

"This, the outcome of a very close exchange of technical information covering many aspects of gas turbine design and manufacture, is particularly gratifying to both parties and is likely to lead to further collaboration between the two companies. The American version of the engine is designated the T58. It is to be used by the United States Navy primarily as a helicopter powerplant including the development of the Sikorsky S-58, which is also manufactured in England by Westland Aircraft. Delivering more than 1,000 h.p. and weighing, with its gearbox, only 325 lb, it has been described as being for its weight and size the most powerful turboshaft engine in the world. The T58 has already accumulated an impressive background of bench and flight testing and passed its official government type approval test in America in October 1957. Initially the new engine, which is to be known as the de Havilland Gnome, will also be used in England in helicopters. Later versions will cover turboprop installations. There are excellent prospects of a good export market."

U.S. Award for James Martin

FAMED as a pioneer in the development of ejection seats, Mr. James Martin, C.B.E., M.I.Mech.E., F.R.Ae.S., has been honoured by America's Flight Safety Foundation, who have made him the recipient of the Laura Taber Barbour Air Safety Award for 1958. The presentation recognizes his "contribution to the safety of crews of high-performance aircraft" through the design and development of ejection seats of exceptional efficiency. The Martin-Baker seats which he has been developing since 1944 are now fitted to all British military jet aircraft and to those of the majority of the Western Powers, including the United States. Over 200 lives have been saved by successful ejections.

It is not, perhaps, so widely remembered that James Martin was also responsible for other highly original inventions, including the explosive cable-cutter to free aircraft wings from barrage-balloon cables; the twelve-gun pack installed in Havoc night fighters; and a gun-feed mechanism of remarkable performance.

The Laura Taber Barbour Award was established in 1956 by Dr. Clifford E. Barbour in memory of his wife, killed in an air accident in 1943.

High-Speed Automatic Landing

A NEW automatic landing system suitable for high-speed aircraft is being designed, and will later be tested in an F-100, by the Los Angeles division of North American Aviation. Called A.I.L.S., it is to cater for various angles of approach used at random and is to provide automatic constant-speed control. Although the system is intended to be fully automatic, manual approach using the visual references and overriding by the pilot

EARLY AGAIN: The first three German Navy Sea Hawk Mk 100/101s, completed a month ahead of schedule by Armstrong Whitworth, have been handed over, and are seen here, with their distinctively heightened fins. Early delivery of Dutch Sea Hawks was recorded last week.

FROM ALL QUARTERS . . .

are to be incorporated. North American also hope to be able to make flap and undercarriage extension and application of reverse thrust automatic as well.

Bell Aircraft have already produced such a system for the U.S. Navy, making use of a form of automatic G.C.A. directing the aircraft autopilot. In this way an F3D Skyknight was successfully landed on a carrier deck without the intervention of the pilot. The associated ground equipment was housed in a series of mobile trailers during these trials. Automatic allowance is made for pitching of the carrier deck.

Proficiency in Gliding

AN indication of the high standard of soaring in Poland, where this year's World Gliding Championships are to be held, was given recently by the F.A.I. In a list of countries whose pilots have obtained Gold C awards with three diamonds, Poland leads with 33. France has 18; the U.S.A. six; Czechoslovakia three; Argentina and Switzerland, two each; and West Germany, Yugoslavia, Great Britain and the Netherlands, one each. The British pilot with Gold C and three diamonds is Cdr. Nicholas Goodhart. The margin between France and Poland is in fact much closer than this list indicates, as France has gained a further 12 Diamond Cs, as yet not confirmed in detail by the F.A.I., to bring her total to 30.

Supersonic Target Towing

GUNNERY practice at supersonic speeds should be facilitated by a target boom developed by North American Aviation, Inc., for installation upon the F-100D.

Made of chrome molybdenum alloy steel, the boom is two inches in diameter and ten feet long and can be attached in a matter of minutes in place of an inspection door on the underside of the fuselage. A few minor modifications enable it to be fitted on the rest of the F-100 series of aircraft.

Retracted under the fuselage when not in use, it can be lowered through 60 deg to snatch a target cable suspended in readiness a few feet above the ground. The boom, which has been tested at George A.F.B., Victorville, is intended for use with the Dart high-speed target.

NAPIER ANNOUNCE GAZELLE JUNIOR

ON January 31 D. Napier and Son, Ltd., announced the existence of a scaled-down version of the Gazelle free-turbine engine; the new unit has the company designation E.222, and it is called—logically enough—the Gazelle Junior. At this stage Napier are prepared to release only very basic particulars of the Junior, but these are sufficient for a general assessment of the engine to be attempted.

Its larger ancestor is now well-known (for full description see *Flight* for May 10 last) and is in production for the Westland Wessex and Bristol 192 helicopters at ratings between 1,260 and 1,800 s.h.p. The Gazelle (which, incidentally, will not be re-styled Gazelle Major) is an omni-angle engine, being installed vertically in the Bristol twin-engined machine and at about 35 deg in the Westland; and a turboprop version could be made available if required. The design is now well proven, and it is a logical measure for Napier to attempt to scale it to meet demands for free-turbine power in different "package sizes."

Ratings for the new engine are given in the data panel adjacent to the illustration. One thousand horse-power is a very important power class, and one which received scant attention from engine manufacturers until recently; the Dart and Mamba started below this level, but both are now giving twice as much power. Since 1955, however, no fewer than seven manufacturers have offered shaft turbines of this size: Blackburn (Twin Turmo, 900 s.h.p.); General Electric and de Havilland (T58, 1,050 s.h.p.); Lycoming (T53, 825/960 s.h.p.); Turboméca (Bastan, 770/800 s.h.p.); Armstrong Siddeley (P.181/182, 1,000 s.h.p.); and Napier (Oryx NOr.3, 900 s.h.p.). In addition to these units, Alvis have been named as a company interested in this field; and it is also safe to assume that there is a 1,000 h.p. turbine in the Soviet Union. It follows that no engine manufacturer can now hope to obtain more than a small proportion of the market, and he will have to fight for every bit of it that he gets.

Napier E.222 Gazelle Junior

Single-shaft, free-turbine, all-angle engine for fixed-wing aircraft and helicopters (latter version depicted). Maximum diameter, 33in; overall length, 54in; weight (as shown, with accessories), 495 lb dry; maximum rating, 920 s.h.p. initially, 1,070 s.h.p. at first development stage; one-hour rating, 765 s.h.p., later 900 s.h.p.; maximum continuous rating, 680 s.h.p., later 800 s.h.p.

In spite of this highly competitive situation—or perhaps because of it—Napier have decided to promote the Gazelle Junior, and preliminary details have been circulated to aircraft constructors at home and overseas. Whether or not the engine is a company-financed venture cannot be divulged, but one would expect such to be the case. Like the bigger Gazelle, it has been planned as an omni-angle unit, and, although initially intended for rotary-wing applications, a turboprop version is being developed for fixed-wing aircraft. Moreover, a coupled Gazelle Junior will also be offered, providing a maximum of about 1,840 s.h.p. All versions will naturally have single-lever control and complete protection for power-turbine overspeed, top-temperature limitation, anti-surge during acceleration and maximum-torque control (with, in the coupled unit, automatic power-increase in the "good" half following failure of the other).

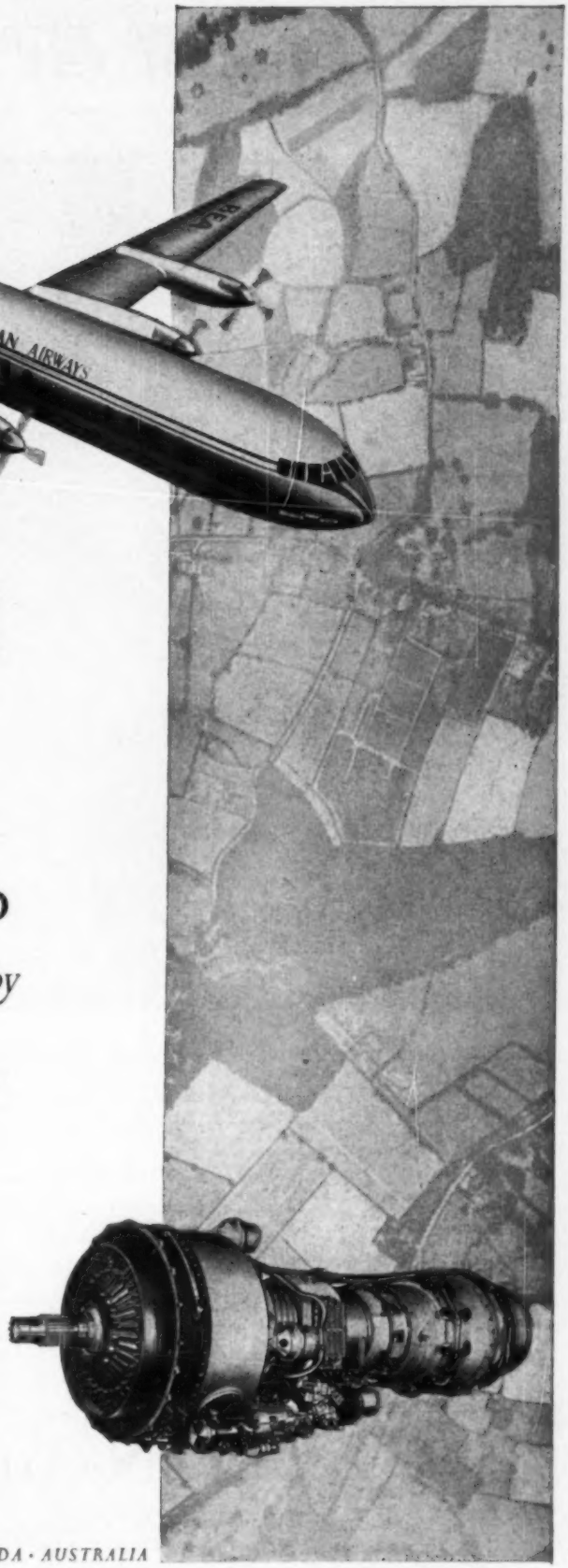
In the accompanying illustration the Junior is depicted in the vertical position. At the lower end is the annular intake casing, which, in contrast to the inward-radial form of the Gazelle intake, entrains air axially. Through one of the "spats" (faired struts) passes the shaft drive to the accessories. This drive is taken through the angle box seen on the left, from which a vertical shaft takes the drive to a banana plate wrapped around the compressor casing and carrying on its upper and lower faces the pressure and scavenge oil pumps, torquemeter pump, fuel pump and other engine accessories—one of which can be seen to be a centrifugal fan for oil cooling and engine-bay ventilation. Provision is made at present for electric or i.p.n. starting.

If the compressor follows previous Napier practice it will have about eleven discs, of either stainless steel or aluminium alloy, pinched together on a steel shaft and carrying aluminium-bronze blades held in fir-tree roots. The can-annular combustion system clearly has six flame tubes, each fed through a diagonally disposed injector (the larger Gazelle has a Lucas-engineered system, with upstream burners). Above can be seen the shrouds around the two-stage compressor turbine and the single power-turbine stage, from which the output is taken via an epicyclic reduction gear incorporating a torquemeter, doubtless similar to Napier's previous designs. Like the Gazelle, the Junior can provide left- or right-hand output rotation according to the type of blading fitted to the power turbine. Prominent in the picture are the four exhaust trunks, with the reduction gear flexibly mounted in the centre.

Unfortunately, it is not yet possible to give any indication of the Junior's state of development. Since Napier are prepared to issue preliminary performance figures one can assume that at least rig testing of the main rotating parts has been started. Moreover, the development of the engine should be both rapid and sure. Napier state that the E.222 design was formulated after a market survey into the power needs of the next generation of single- and twin-engined helicopters. This is perhaps a reference to new projects on the boards at Bristol, Westland, Fairey or Saro.

ROLLS-ROYCE
TYNE
PROP-JETS
power the
VICKERS VANGUARD

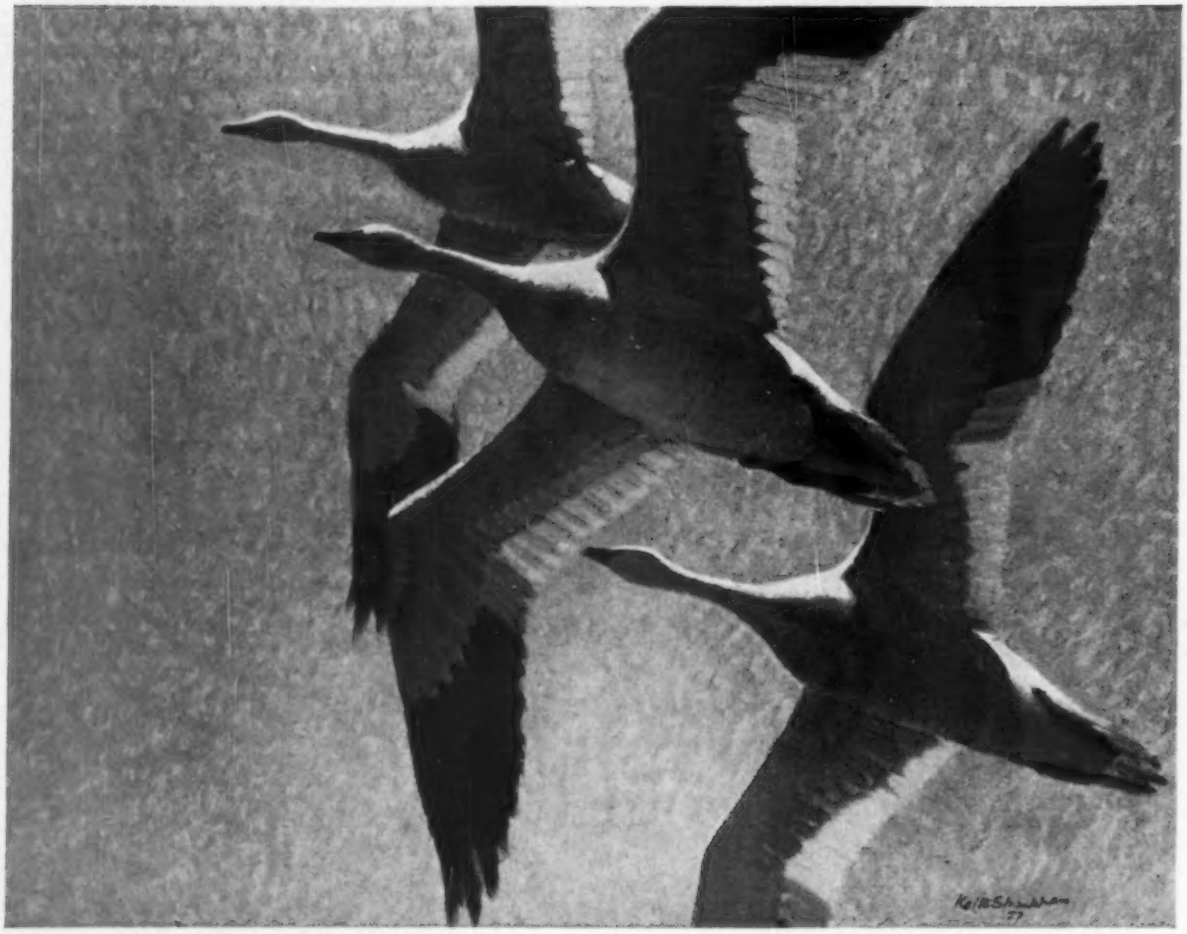
Vanguards have been ordered by British European Airways and Trans-Canada Air Lines



The Tyne is an advanced twin spool high compression engine in the 5,000 h.p. class. It has been designed to give a very low specific fuel consumption and is backed by the unique experience gained by Rolls-Royce in more than 3,000,000 hours operation of gas turbine engines in scheduled airline service.

ROLLS-ROYCE LIMITED · ENGLAND · SCOTLAND · CANADA · AUSTRALIA

FREEDOM OF THE AIR



No. 1 in a series of paintings by Keith Shackleton S.Av.A. presented by Cellon Limited

Snow Geese against the Sun

The Snow Goose is a native of North Eastern Arctic Canada migrating southward in the winter to the Gulf coast and southern U.S.A. It does, however, occasionally come across the Atlantic and is fairly regularly seen in small numbers in Great Britain and Ireland, generally in the company of other Arctic Geese which winter here.

CELLON AIRCRAFT FINISHES

CELLON LIMITED · KINGSTON-ON-THAMES · TELEPHONE: KINGSTON 1234 (9 lines)
CVS-872

B.E.A.'s Jet: Cards on the Table

IT is a matter of protocol in the selling of aircraft that a prospective buyer is not named unless he gives his consent. To do otherwise, in the hope of attaching some seal of approval to a product, or to advance its cause, is not only bad form; it is also foolish. This has always been scrupulously recognized by the commercially mature British manufacturers, who include de Havilland, Bristol, and the Hawker Siddeley Group.

Bearing this in mind, we might consider how the illustrious name of Pan American World Airways has come to be drawn into the B.E.A. jet controversy.

The chairman of Bristol Aircraft, Sir Matthew Slattery, confirmed last week that PanAm were indeed the "prominent American airline" at whose "invitation" the Bristol 200 sales team went to America at a stage in the round-table talks when the odds against the 200 appeared to be mounting. Sir Matthew, who was giving his personal views about the B.E.A. jet controversy, said that PanAm's interest was "very serious," and that negotiations had reached a stage when the third draft of a form of contract was being exchanged. The invitation to America had come from Franklin Gledhill, a PanAm vice-president, in a letter written last December.

Such negotiations do not generally reach contract-drafting stage, nor does a manufacturer publicly say so, unless the airline has an order closely in prospect. This is the light in which to judge Sir Matthew's contention that, before the Government approve a B.E.A. order for 24 D.H.121s from Airco (see below) they should wait to see the outcome of export talks.

However, the day before Sir Matthew's conference, PanAm had issued the following statement:—

"Pan American, being in the air transport business, are always interested in any new aircraft and its executives are interested in discussing same. In this sense, Pan American and the Hawker Siddeley-Bristol group, and the de Havilland group, will almost certainly be in contact. This does not, repeat not, however, imply that Pan American is on the threshold of purchase negotiations, only that it maintains an open door policy for any supplier whose products improve its service."

This statement was issued as a result of reports in British newspapers of PanAm's interest in the 200, reports which led de Havilland—apparently to PanAm's complete surprise—to say:

"Pan American Airways have informed de Havilland that they will be glad to discuss the D.H.121 as designed for British European Airways as soon as it is appropriate for a meeting to be arranged."

And, when PanAm's New York office was asked whether PanAm were in fact the airline which invited the Bristol 200 team to the U.S.A., the reply was: "When Bristol wished to make a presentation, they received an invitation to do so."

All this is put on record because PanAm's undoubted interest in the Bristol 200 is the crux of the Hawker Siddeley-Bristol case at the present time. If this interest develops into an order—or even into a letter-of-intent-to-purchase—the B.E.A. predilection for the D.H.121 could be swayed. Sir Matthew Slattery said that Hawker Siddeley-Bristol might go ahead with the 200, if there were enough orders to make it commercially sound, with or without a B.E.A. order. "If we get to the position where we see 20, 30, 40 aeroplanes more or less in the bag, we shall go ahead." This was not a "threat, flag-wagging, or bluff."

Sir Matthew recognized B.E.A.'s preference for the de Havilland design team, but contended that it was in the national interest for B.E.A. to place the order for the Bristol 200 with the Hawker Siddeley-Bristol team. He emphasized the strong financial resources behind the Bristol 200, saying:—

"It is not true that this is wholly a private venture. Substantial progress payments are being discussed, which might be 50 per cent by the time of delivery. This might be anything up to £10 million if things went wrong. Would the Government say goodbye to £10 million or would they put a rescue operation into effect?"

To build only 24 aircraft for B.E.A. would, he said, mean £10 million "down the plug," and this was the significance of the immense resources behind the Bristol 200.

From the rival camp last week came the first hard facts about Airco, the joint de Havilland, Hunting and Fairey company which is to be formed to build the D.H.121.

Financial participation in Airco* will be in the proportions: de Havilland 67½ per cent, Hunting 22½ per cent, Fairey 10 per cent. There will be respectively four, two and one members on the board of directors. Handley Page, according to the Minister of Transport last week, "has offered technical assistance to the de Havilland company because of its special experience with high-speed aircraft and tail design." Saunders-Roe, Ltd., the Minister added, might help with sub-contracting.

Rolls-Royce will be financially and technically responsible for development of the powerplant (the RB.141 by-pass turbojet) and —most significantly, because this is usually a major "airframe" job—they will be responsible also for its installation.

A fair assessment of these D.H. proposals might be that, though they do not in terms of size, assets, or production capacity, match those of the Bristol-Hawker Siddeley company (see accompanying tables), they should at least be sufficient to develop the D.H.121. It is significant that the de Havilland company last week went on record with the statement: "The three Airco companies concerned have more than adequate financial resources to carry the risk of selling or not selling the D.H.121, assuming that the B.E.A. order is for 20 to 25 aircraft." This does not tally with Sir Matthew Slattery's view; but it suggests that the taxpayer would not have to come to Airco's rescue if things went technically wrong with the 121.

The "final de Havilland proposals," according to the Minister's statement in the Commons debate on January 27, only reached him that morning. It seems fair to record de Havilland's comment that their proposals, as just outlined, had in fact been submitted to the Government some time before (having, it is believed, been redrafted several times). The final proposals contained nothing basically new, according to D.H., but were the existing proposals put into final legal and audited form.

This apparent stalling by the Minister, and his suggestion that we wait and see how the Bristol 200 team gets on in America, clearly indicates the Government's continuing predilection for the Bristol-Hawker Siddeley combine.

To sum up: each party in this unhappy controversy has now put its cards on the table. B.E.A. want the de Havilland team; the Government prefer the Bristol-Hawker Siddeley team (or a stronger D.H. consortium); de Havilland say they are strong enough to see the D.H.121 through; Bristol and Hawker Siddeley suggest that PanAm are close to buying the Bristol 200.

Where now? Time is pressing, though not yet so pressing that a few more weeks' delay will jeopardize the export potential of this new transport concept. Much is at stake for Bristol, whose prospects in the turboprop field are certainly not improved by the shelving of the Orion. At least the aircraft firms in the Hawker Siddeley group have a widening base of general industrial interests to support them.

So, if PanAm's interest in the Bristol 200 is as genuine as Sir Matthew Slattery has indicated, should there not be a time-limited period for Hawker Siddeley-Bristol to attempt to secure an order? If, within that time limit, this fashion-influencing U.S. airline orders the Bristol design, knowing as it does where B.E.A.'s preferences lie, then it would be in the national interest for Bristol to get the B.E.A. order. Otherwise the order must go to de Havilland.

Above all, the greatest care must be taken to avoid causing offence to PanAm. If their interest in the 200 is only as routine as their public statements imply, they may feel that their good name is being used for kite-flying. There was, perhaps, a warning note in the words of one of their London spokesmen last week, who said: "We don't like being the meat in the sandwich."

**Airco is short for Aircraft Manufacturing Company, the firm with which Sir Geoffrey de Havilland was chief designer in World War I, and which built the D.H.1, D.H.2, D.H.3, etc., up to D.H.18.*

THE BALANCE OF POWER

The tables below compare productive capacities of the two groups competing for the B.E.A. jet order. They show that, allowing for the important footnote qualifications, there are roughly 50 per cent more people, and about twice as much production floorspace, behind the Bristol 200. The relative figures for aircraft built since the war are included for good measure; they approximate surprisingly closely, though of course D.H. have not built as many heavy aircraft as Hawker Siddeley. It is impossible to assess accurately the relative financial strengths of the two groups; but a rough evaluation of the interests behind each suggests that the net worth of the Hawker Siddeley-Bristol group is perhaps three times that of its rival.

The Bristol 200 Consortium

Aircraft Firms Involved	U.K. Employees	U.K. Factory Area sq ft	No. of Aircraft Built since 1945
A. V. Roe	40,000*	11.5 million*	8,500
A.W.A.			
Gloster			
Hawker			580
Bristol Aircraft ...	13,000	6 million	
	53,000	17.5 million	9,080

* Includes substantial figures for Hawker Siddeley engines and missiles.
N.B. Short's 2m sq ft and 9,000 employees not included.

The de Havilland D.H.121 Consortium (Airco)

D.H. Aircraft** ...	18,400	4.2 million*	5,646†
Fairey	8,000	2 million	1,365
Hunting Aircraft ...	2,500	0.35 million	1,500
	28,900	6.55 million	8,511

* Includes Saunders-Roe exported for licence-assembly. † Excludes large numbers of fuselages, wings etc. ** Excludes Engine and Propeller Companies.

SIR ARTHUR BENSON, Governor of Northern Rhodesia, about to enter a Bell 47G-2 for a demonstration flight from Government House, Lusaka, with Capt. "Jimmy" Youell. This veteran airline and helicopter pilot—he has over 20,000 flying hours—is now with Autair Helicopters (Africa), Ltd., engaged on various survey and exploration contracts.

HERE AND THERE

Nairobi Display

A COMBINED air display and static exhibition is being held at the new Nairobi Airport on March 9, the day following its opening by the Queen Mother. East African Airways are participating in the exhibition; the R.A.F., Kenya Police Air Wing and the Aero Club of East Africa are expected to stage flying displays, and Spartan Air Services (Eastern), Ltd., will demonstrate helicopter performance.

Long-life Helicopters

BELL have announced that their 47G and 47G-2 helicopters "are now authorized to fly a distance equal to four times around the world at the equator without major overhaul." This extension—which has C.A.A. approval—doubles the period between major inspections from 600 hr to 1,200 hr; and the previous 25-hour inspection now becomes a 50-hour one.

N.Z. High Jumps

TWO members of Auckland Parachute Club, Mr. J. Charnock and Mr. P. Dawson, recently set up what are claimed to be two new parachuting records for New Zealand —for a jump from 19,100ft with a free fall of 17,100ft (exceeding a previous unofficial delayed-drop record by 3,100ft). Both men jumped almost simultaneously from a Cessna 180, and employed the gliding technique perfected by the French "birdman" Leo Valentin, to prevent spinning and somersaulting.

Ethiopian Road Survey

OPERATING from Addis Ababa, two Lodestars and a Dakota of Hunting Aerosurveys, Ltd., are now at work under an extension to an aerial survey contract awarded to the company by the Imperial Highway Authority of Ethiopia last year. When completed, this photographic survey will cover some 73,000 square miles in the west central and north-west regions and provide information for Ethiopian road developments.

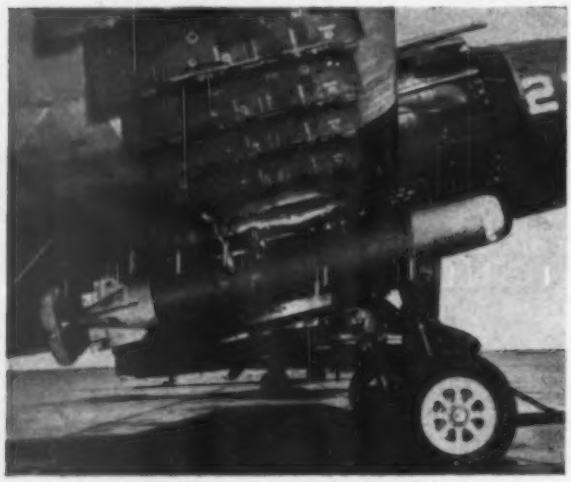
Montgolfier Miniatures

A SET of four octagonal miniatures in a frame, depicting the first balloon flights by the Montgolfier brothers in 1783, is to be sold at Sotheby's on February 13. There is also a separate circular miniature of the brothers' ascent at Annonay in June 1783.

MR. J. Y. TOMLINSON, who has been appointed chief service engineer (gas turbines) by Bristol Aero-Engines, Ltd. He will be chiefly concerned with the Proteus engines in the Britannias of B.O.A.C. and other operators. Also appointed are Mr. A. M. Chittenden as chief service engineer (piston engines) and Mr. E. G. Pippin as chief service engineer (repair).

Brancker Memorial Lecture

SUBJECT of the 1958 Brancker Memorial Lecture, arranged by the Institute of Transport, will be *The Control of Air Traffic—Origin, Development and Future Requirements*, and not as originally announced. The lecture, which will be at 5.45 p.m. on February 10 in the Jarvis Hall, 66 Portland Place, London, W.1, will be delivered by A. Cdre. W. E. G. Mann, C.B., C.B.E., Director-General of Navigational Services, Ministry of Transport and Civil Aviation. The meeting will be open to visitors, without ticket.



ANTI-SUBMARINE: This is the American anti-submarine torpedo Mk 43 with electric-motor propulsion and acoustic homing. It is seen shipped on a Douglas Skyraider and was designed and developed for the U.S. Navy's Bureau of Ordnance by the Clevite Corporation of Cleveland.

Reverse-thrust Aerobatics?

A MOSCOW radio report claims that a thrust-reversal device tried out on a number of Soviet aircraft has not only reduced by half the landing run required by fighters but has also improved their manœuvrability and aerobatic capabilities.

German Blimp Project

A NON-RIGID airship 150ft long equipped to carry five people is to be built by the Friedrichshafen Metal Works, successor to the pre-war company which built the great airships *Graf Zeppelin* and *Hindenburg*. It will be used for advertising and similar purposes.

Canadian Air Jubilee

TO co-ordinate this year's commemorations of the 50th anniversary of powered flight in Canada a national council has been formed representing all aspects of the country's aviation and with Gordon J. Stringer of Canadair, Ltd., as president.

Persian Gulf Research

A NEWLY established Dutch aviation concern, Aero Contractors (formed jointly by the Aero Ypenburg, N.V., and M.B.V. companies) has concluded an agreement with the Iranian Oil Exploration and Producing Co. for geological research by helicopter in the Persian Gulf area. Two Agusta-Bell 47Js will be used.

NEXT WEEK

AIR SURVEY will be the subject of a special section of next week's (February 14) issue of *Flight*. Modern methods of photographic and geophysical survey will be explained in detail, and typical equipment described and illustrated. A directory to the principal companies engaged on air survey work will complete the review.

For Further Study

AERONAUTICS is one of 13 main subjects included in the 1958-59 syllabus of postgraduate courses published by Imperial College of Science and Technology, South Kensington. Lecture subjects comprise high-speed flow, inviscid and viscous flow, stability and control, turbulent flow and heat transfer, aircraft structures and aeroelasticity.

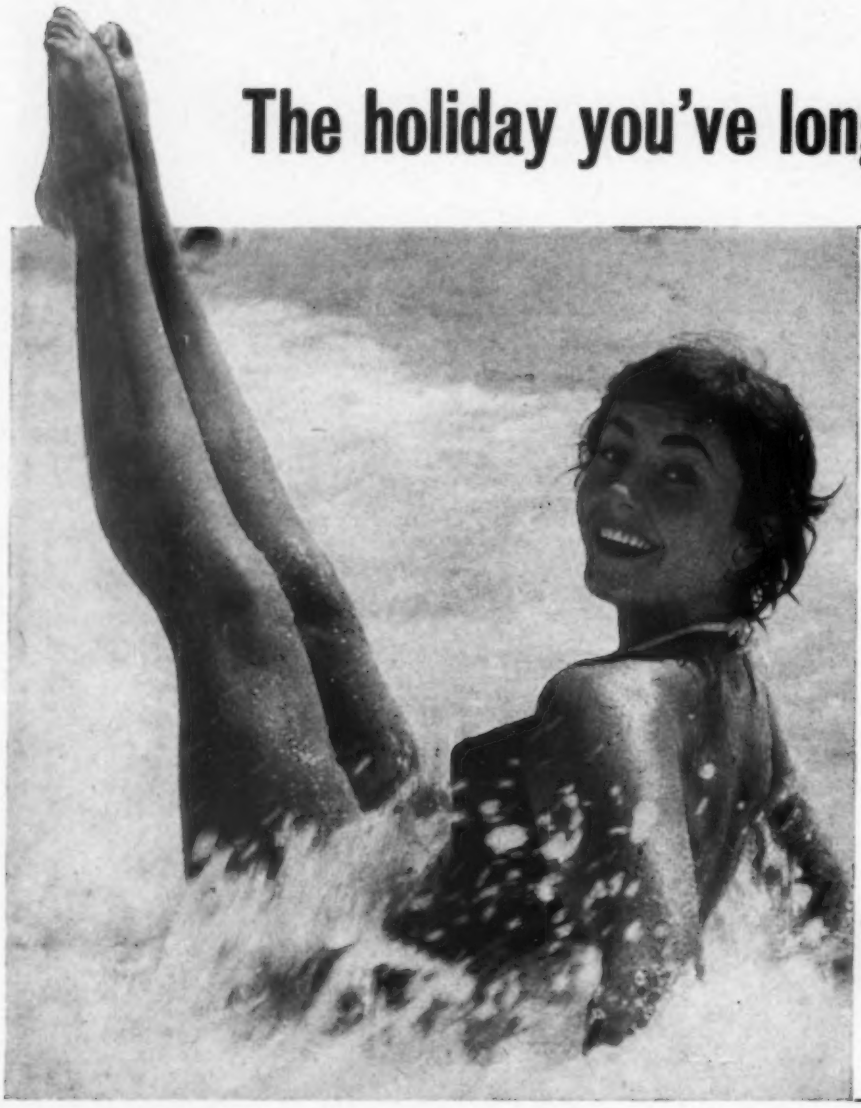
Cessna Sales

NO fewer than 2,489 commercial aircraft were produced and delivered by Cessna Aircraft Company, Wichita, during 1957. Most of the machines were business and executive types: the total comprised 36 Model 170s; 939 Model 172s; 1,273 Model 180s, 182s and Skylanes; 150 Model 310s; one Model 195; and 90 Model 305s. The new Cessna 175 is scheduled for introduction next month.

ROTOL PROPELLERS AND GEARBOXES
ARE FITTED TO ALL TYPES OF
ROLLS ROYCE·DART ENGINES

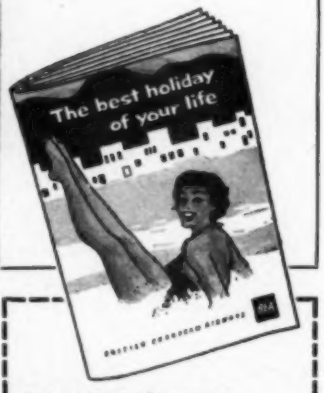
D

The holiday you've longed for



...so quickly yours with BEA

Laughter and lazing in the middle of a sunny summer paradise! A subject for wishful winter dreaming? Or something to enjoy planning now, when the days are at their darkest? At BEA we say :—lay your plans right away for a gay and sunny holiday. Get the whole thing buttoned up now. Then you'll go *where* you want, *when* you want, at the price you want to pay.



All-in holidays abroad, flying BEA, give you everything!

All-in holidays *flying BEA* are perfect from every standpoint. Kind to your holiday dreams, kinder still to your pocket. For example, you can have an exciting all-in continental holiday (including minimum air-fare and hotel accommodation) for as little as £19. And a flight in a BEA Viscount gives you that joyous holiday feeling from the moment you take off. Everything is geared to your comfort and enjoyment. In every sense you're on top of the world. Just one last reminder. Please don't leave your planning too late. For a small deposit your travel agent can make certain of your holiday reservation *now*. So ask him about "ALL-IN" holidays flying BEA. Or post the coupon for BEA's latest all-in holiday book.

For the best holiday of your life

fly BEA

BRITISH EUROPEAN AIRWAYS

Send now for your free copy

of BEA's 24-page illustrated book 'THE BEST HOLIDAY OF YOUR LIFE.'

To BEA, 18, Lower Regent Street, London, S.W.1.

NAME .....

ADDRESS .....

The Nord SS-10 Anti-tank Missile

"*Not a Projectile, but a Miniature Rocket-propelled Tailless Aircraft*"

A production round on its tubular zero-length launcher.

AS was reported on page 976 of *Flight* for December 27, a large number of the French Nord SS-10 wire-controlled anti-tank missiles has been ordered for the U.S. Seventh Army in Germany. This order was not in any sense a political gesture to a NATO country's aircraft industry, but was the conclusion of several years of intensive investigation of the weapon, during which one American ordnance chief said that, "It is one to three years ahead of any equivalent U.S. weapon."

The SS-10 is standard equipment in the French Army and has been adopted also by Sweden, Switzerland and West Germany; and it was the SS-10 which enabled the Israelis to immobilize the Russian-built Egyptian armour in the Gaza strip. The French also use batteries of the SS-10 mounted in assault craft. It is understood that the Canadians are showing interest in the weapon.

Brief History. The SS-10 owes its origin to ideas brought to the then Arsenal de l'Aéronautique by expatriated German technicians just after the war. The late General Vernisse, with his great experience as a military engineer, foresaw its value and encouraged its development to the full. Energetic backing was essential, for there was then no established missile industry in Europe and every item had to be specially developed. One recalls General Vernisse's particular pleasure in the successful evolution of a high-r.p.m. solid-propellant-driven gyro ("powder gyro") with an extremely rapid acceleration.

Development of the weapon system continued to the production stage, so that early in 1952 the U.S. Ordnance Corps was able to order 500 for trial, with deliveries during late 1952 and early 1953. These weapons were tried in the U.S.A. at the Aberdeen Proving Ground, Fort Benning and Quantico Marine Corps Base. Quite a few teething troubles—largely of an environmental nature—became apparent, and the French offered to replace by an improved model a hundred weapons which appeared to have deteriorated in storage. (This question of dubious shelf-life was then pretty general in the embryonic missile world—and, in fact, still constitutes a major problem.)

The revised weapon was available by 1955 and in the following spring a U.S. Army Ordnance mission was so impressed by witnessing a French Army demonstration that it recommended the purchase of a further batch for re-evaluation. American interest was, apparently, aroused not only by the excellence of the weapon itself, but by the comprehensiveness of the system—from the synthetic trainers to the jeep-mounted battery. Finally, a full-scale trial in June at the Mailly Range convinced the U.S. Army that it was a good thing, so that in November the order for 1,170 missiles and associated equipment for the U.S. Seventh Army in Germany was placed by the U.S. Ordnance Procurement Office in Paris.

During the course of the evolution of the SS-10 the Chatillon-sous-Bagneux factory has become successively SFECMAS and then, upon the death of General Vernisse, a main part of the SNCAN. During these administrational and organizational changes, substantially the same team of engineers, led by Ingénieur-en-chef E. Stauff, now Director of the Guided Missile Department, has carried through from design to production. Essentially, the Chatillon factory is a design office with extensive experimental facilities, production being undertaken by other SNCAN factories. The SS-10's other designation, 5202, is a survival of a project-numbering system of the Arsenal, with "1" as the first digit for manned and "5" for unmanned aircraft.

Rear view of SS-10 on its launcher inside the standard storage and transport crate.

The Missile. Details of the SS-10, other than external ones, are in the restricted category, but it is permissible to give a general idea of how it operates.

In the first place, the SS-10 is a miniature rocket-propelled tailless aircraft. It is not in any sense a projectile: it is supported by the lift of its cruciform wings, which are set at an angle of incidence to the fuselage centreline, and so rotate the aircraft that it is directionally spin-stabilized. Pitch and yaw couples are produced by spoilers set in the roots of the wing trailing-edges.

The wings are flat-plate aerofoils with radiused leading and trailing edges. They consist of a wrapped light-alloy skin, joined along the trailing edge, with a balsa wood core. Skin and core, together with the magnesium-alloy attachment flange, are assembled entirely by Aero Research Redux bonding. The flange is fixed to the missile body by six mushroom-headed bolts.

The spoilers are similar to those on the CT-10 target (*Flight*, May 5, 1956) in that they constitute a bulged fairing on the trailing edge over which the airflow accelerates locally—it is "contained" by endplates—so ensuring that there is no boundary-layer separation. Inside each fairing is a spanwise plate which is vibrated so that it extends outside alternate surfaces twelve times a second. The electrical command signals modulate the "up" and "down" time ratio of the spoiler vibrations, but do not affect the amplitude. What happens is that, as the missile rotates, pitch and yaw signals are fed to on-off contacts over the appropriate roll segments, each spoiler alternating as a rudder and elevator.

The gyro, which is accelerated to very high r.p.m. in 0.1 sec by a powder-charge impulse, "coasts" during the 17 sec (max.) flight of the SS-10—actually with an effective reserve of almost a hundred per cent on its useful running time. The gyro, which is automatically uncaged immediately after the rotor is fired, keeps the control-signal box aligned as the aircraft rotates, and the pitch and yaw signals are transmitted through slip-rings and brushes to the actuating solenoids of opposing pairs of spoilers alternately—the action of each pair is, of course, reversed every 180 deg.

Propulsion of the SS-10 is by two solid-fuel rockets with concentric nozzles. The outer nozzle is that of the booster rocket, which accelerates the missile to full speed (260-295ft/sec) in about 0.5 sec, thus enabling zero-length launchers to be used. As the booster charge burns it ignites the sustainer through flash drillings between the tandem chambers. The nozzle of the sustainer is quite small, so a flare is fitted to the tail of the "fuselage" to aid aiming in poor visibility.

The missile is made in two assemblies, the warhead and the wing/body/engine unit, and storage is normally separate. The nose (warhead) section clips on by three quick-release toggles and a latch, the only other action required being the insertion of the dry battery which energizes the spoiler actuating circuit. The joint between the two sections is designed so that it cannot be made until the battery is in place. [*Contd. overleaf*

THE NORD SS-10 ANTI-TANK MISSILE . . .

The SS-10 has remarkable armour-piercing properties—it can go through as much as sixteen inches of naval armour plate—a penetration achieved not by impact velocity but by the well-known principle of the shaped charge. Roughly speaking, this is a hollow-conical pack of explosive which hits the target base-first; as it ignites, intense heat is generated inside the cone which first melts the steel and then bursts through with a blast of shock-waves and molten fragments. The fuze of the warhead is armed by pressure from the burning sustainer rocket, so that premature explosion is impossible.

The two parts of the weapon are stored in a strong metal crate, or case, the whole being shockproof. The French Army submits samplings of all deliveries to severe shock, vibration and climatic tests, after which only 4 per cent of failures are permitted. Cocooned in its crate, the weapon is considered to have an infinite storage life; but the battery, carried in a small external stowage on the crate, has to be renewed after five or six months. The whole weapon system has been proved for operation over a temperature range from −35 deg C to +50 deg C (−31 deg F to +122 deg F) and is fully waterproofed.

Launching and Deployment. The SS-10 can be launched in a variety of ways; or, more precisely, the little basic tubular launching bracket can be placed almost anywhere. The French Army likes to keep it in the carrying case, which is put on the ground as a unit of a battery; the Americans are more interested in the triple unit on the jeep chassis; while the French Navy has mounted the crates on assault craft and even on the pom-pom mounting of a gunboat—this last being to obtain traverse. The French Army has also fired it from slow-flying aeroplanes and helicopters.

The launching bracket consists of a tubular arch carrying a short fabricated rail and base tubes, both of which project forward. Launching incidence appears to be 10 to 15 deg. The arch has a socket which joins the cable from the command set to the two guidance wires and a yoke that holds the wires clear of the rocket exhaust to port and starboard at the launch. The steel wires, which are very thin, are enamel-insulated, since they twist together as the missile rotates. Each wire has to be coiled helically, like a mooring rope, as it is pulled out too fast for any rotating bobbin.

The VLR-Delahaye jeep-mounted launching truck, showing the "marksman" using his binocular sight and control stick. This is an actual firing (the control wires are just visible).

The command equipment has been designed to give the maximum flexibility of deployment in the field. The batteries of missiles (normally six) in their launcher cases are strategically positioned and are connected by cables to a junction box, in turn wired to the signal generator unit, which also incorporates the missile selector and firing control. This unit, which is usually in a concealed position, is attended by one member of the two-man operating crew. He is instructed by the "marksman," through field telephone or walkie-talkie radio, to select and to fire the desired missile from the battery. H.T. current for the signal generator, supplied by a field battery specially protected against rough handling, relays control signals to the missiles according to the position of the universally mounted control stick switch of the marksman—who may be hidden as much as a couple of hundred yards away. The marksman has a graticuled binocular sight, but the missile can be aimed by eye, according to the distance and visibility. The marksman's control can be wired to more than one missile battery.

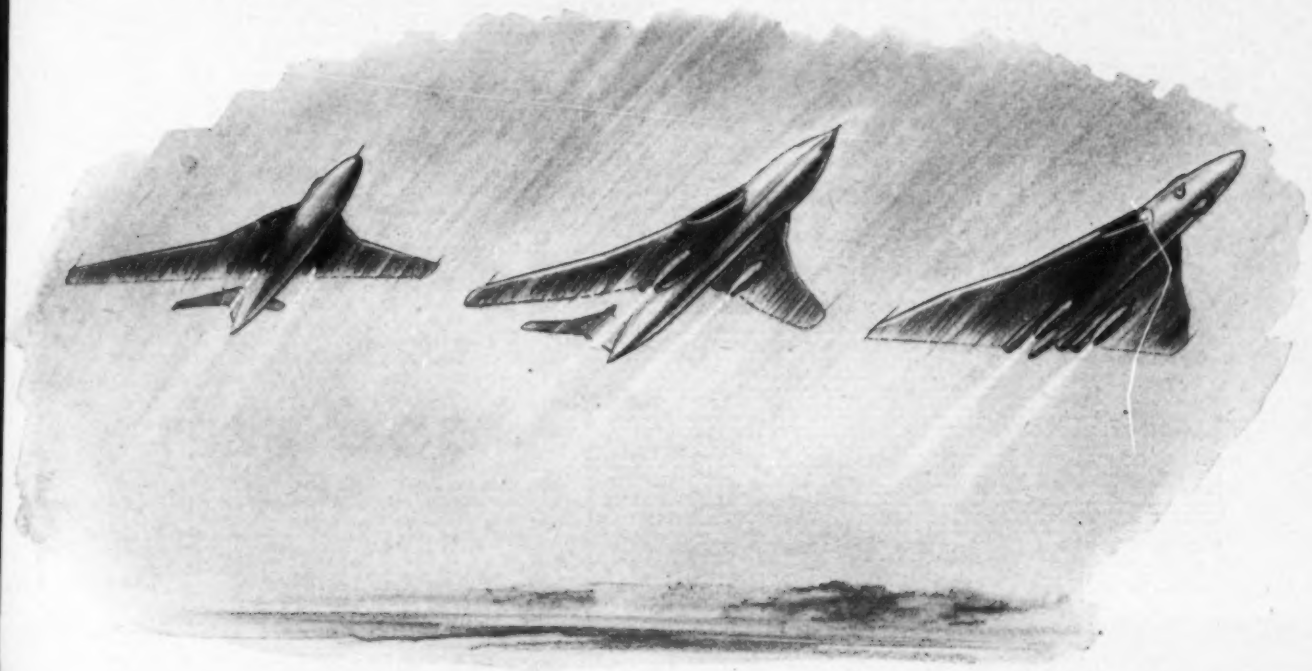
[*Contd. on page 171*

Offensive helicopter: A Sud-Aviation SE-3130 Alouette being demonstrated with a battery of six Nord SS-10 anti-tank missiles.

(Below) Firing of an SS-10 from a French Army Morane Storch during trials.

Instructor and trainee using the Dorand "cinétir" simulator. The ciné projector screens the target picture, while the smaller projector superimposes a light-spot simulating the missile's trace-flare; movement of the spot is controlled by the joystick between the pupil's hands.

SPECTRES AND SUPER SPRITES
are behind the V-Force



de Havilland liquid-propellent assisted-take-off rocket engines are in production for the Valiant (Super Sprites) and the Vulcan and Victor (Spectres).

Dropped by parachute after use and quickly recovered for repeated operation they provide the most economical means of enabling heavily loaded strategic bombers to fly from existing medium-length runways throughout the world.

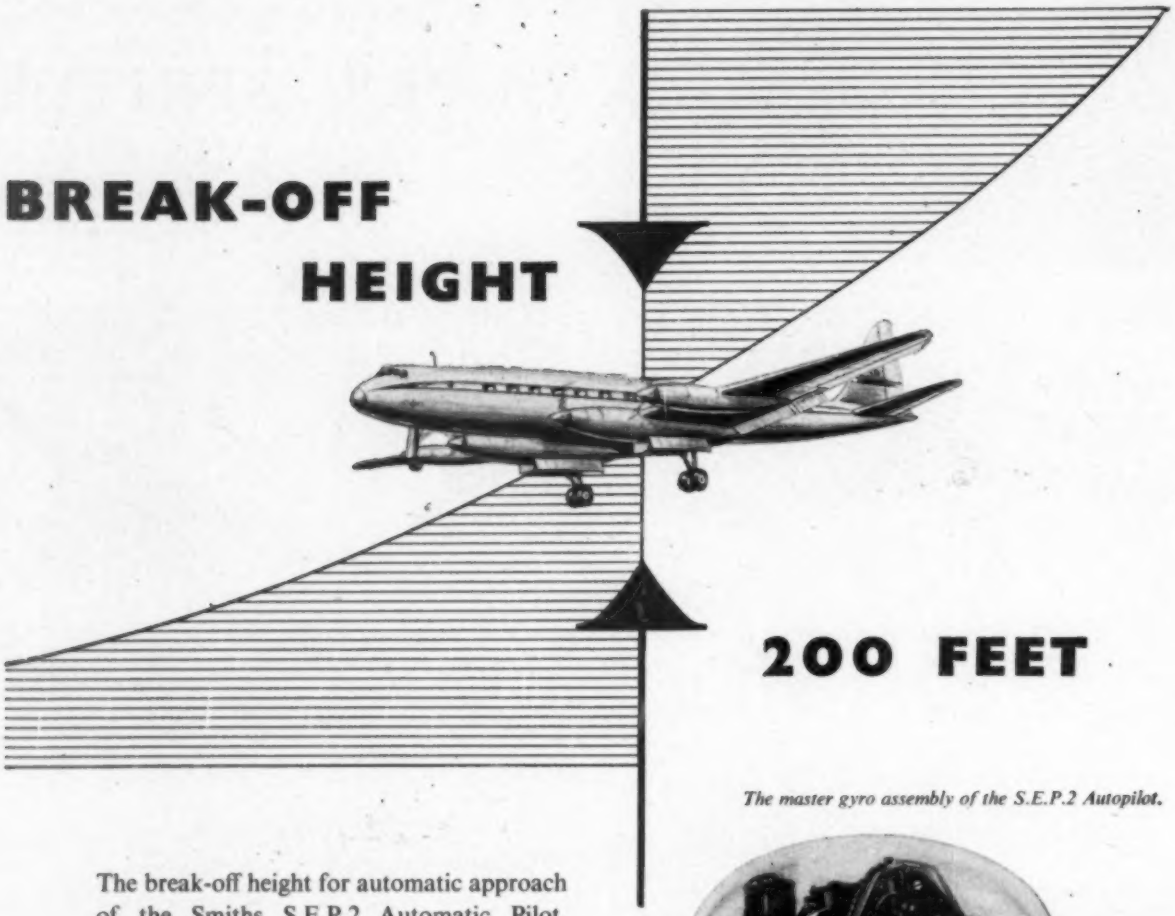
Operational flexibility is thus increased manyfold.

Variable thrust versions of the Spectre are in production for other military applications.

THE DE HAVILLAND ENGINE COMPANY LIMITED

LEAVESDEN · HERTFORDSHIRE · ENGLAND

BREAK-OFF HEIGHT



200 FEET

The master gyro assembly of the S.E.P.2 Autopilot.

The break-off height for automatic approach of the Smiths S.E.P.2 Automatic Pilot, approved at 200 ft. by the A.R.B., is now the lowest figure for any civil Autopilot in airline service. By coupling to ILS or VOR beams the Autopilot permits precise automatic approach to a runway and reduces the number of missed approaches. Barometric height and speed control, pre-selected heading control and automatic elevator trim are other important safety features. The S.E.P.2 simplifies the pilot's task immensely when operating his aircraft through complex air traffic control patterns.

Smiths S.E.P.2 Automatic Pilot is fully approved by the American Civil Aeronautics Administration.

SMITHS

S.E.P.2 AUTOPILOT

IN SERVICE AND ON ORDER FOR 19 OPERATORS

SMITHS AIRCRAFT INSTRUMENTS LIMITED

The Aviation Division of S. Smith & Sons (England) Limited, Cricklewood, London, NW2

TGA SM43R

THE NORD SS-10 ANTI-TANK MISSILE . . .

The VLR-Delahaye jeep-mounted launcher is obviously a simpler set-up, since it is entirely self-contained. The driver and the marksman (who faces aft) are protected from the rocket exhausts by a sheet-steel shroud. However, the missiles on their launcher, together with all the control equipment, can be very rapidly removed and transported by hand if desired, as might be necessary in rough or woody country. Alternatively, the missiles and the signal generator may be left in the jeep, a long cable unwinding from a reel permitting the marksman to take the control-stick unit to a better observation point.

The SS-10 has a fan-like field of fire, rather in the form of a Lochaber axe-head, with a traverse of about ninety degrees. The maximum range is just under a mile and, equally important, the minimum killing range is short—some missiles of this class are useless at close range. It is regular practice to penetrate 400 mm (16in) naval armour plate at 90 deg and 200 mm (8in) plate at 60 deg. As an alternative to the armour-piercing warhead there is an anti-personnel fragmentation type, and for training there is an inert nosecap.

Training. It is claimed that training SS-10 operators to a high standard of accuracy is extremely rapid. Certain minimum standards of eyesight and reaction/co-ordination are required, for the assessment of which SNCAN are developing an aptitude tester. Two training simulators have been produced; the *simulateur d'entrainement* and the *ciné-simulateur D-X 40* or *"cinétir,"* which was developed for SNCAN by Giravions Dorand.*

The first device is a cabinet with a cathode-ray tube on which are superimposed various geometrical patterns. The trainee has a standard joystick, which controls a luminous dot that he must trace along the patterns. During this phase he develops accuracy and a steady hand (about 10 per cent of pupils are rejected). The next stage is to mount a mechanical target, about half an inch square, in front of the screen to give the pupil practice in tracking a moving object. The speed of this target is increased as proficiency improves.

The second simulator, which is in production as a trailer unit for field service since it offers economical practice as well as training, is relatively elaborate. A moving target is projected on a panoramic screen, and a spotlight controlled by the operator's joystick is superimposed to represent the missile's trace flare. The joystick actuates the spotlight through an electro-mechanical computer, which relates it to the time of flight and introduces representative control-response lag. The computer also measures the range of the target and "freezes" film and spotlight when the "missile" has travelled this distance. The instructor can then assess the accuracy and explain any faults to the pupil. The instructor also has a cut-out switch, with which he can freeze film and spotlight at any time.

The average period of training is four weeks, during which firing of actual missiles takes place. Average accuracy is of the order of 80-90 per cent for trained army marksmen.

J.H.S.

LEADING DATA

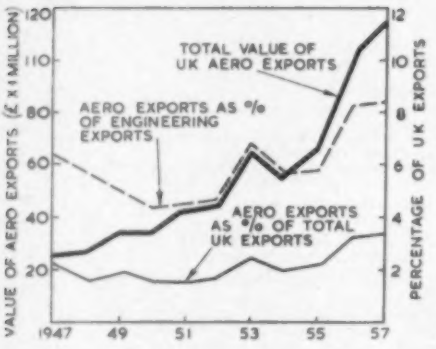
Missile: Length, 33.85in; span, 29.52in; weight, 33 lb; warhead weight, 9 lb; range, 5,000ft; velocity, 180 m.p.h. approx.
Crate: Height, 23.22in; width, 22.44in; length, 22.04in; weight empty, 55 lb; weight of control stick, selector, power pack, cables, 84 lb total.
Costs (approximate): Training round (cocooned in crate), £320; armed round, £340; field set, £1,750; training simulator, £2,750; cine-simulator, £19,500.

**This is the electronics division of the company founded by R. Dorand, the French helicopter pioneer, who designed an intermeshing rotor helicopter after the war while with the SNCA du Centre, which was later absorbed by SNCAN.*

THOR'S PLAYGROUND: THE WEAPON SYSTEM OF A BALLISTIC MISSILE

This photograph is one of the first to show a complete IRBM weapon system, albeit in a somewhat idealized form. Taken at the Culver City (Los Angeles) Plant of Douglas Aircraft, it shows the SM-75 Thor IRBM system exhibited for design and engineering inspection by the U.S.A.F.

The weapon itself, which has a design range of 1,500 miles, is powered by a single Rocketdyne motor of 165,000 lb thrust. It is shown at A, with a dummy nose cone. Partly masking the body is a vertical inspection ladder. The 65ft weapon is raised on to its launcher (B) by a hydraulically actuated arm and cradle which has returned to its horizontal position at C. Once settled in the vertical launching position the SM-75 can be filled with propellants: the liquid-oxygen tank is at D, with pumps, filters, valves and controls at E; the smaller kerosine tank is at F. Helium gas is fed at high pressure from truck-mounted bottles at G. By the portable ladder at H is the megaton-yield warhead and rounded nose-cone and re-entry body, mounted on a special cradle. In the foreground are guidance-support vans J. All this is alleged to be production equipment; Douglas claim to be tooled for 90 SM-75s per month but to be held to two per month.



Post-war growth of United Kingdom aviation exports related to total exports.

Britain's Aircraft Exports

CAN THE RECORD HIGH LEVEL OF 1957 BE MAINTAINED?

WHEN the value of United Kingdom aeronautical exports exceeded £100m in 1956, observers speculated whether this was a flash in the foreign-trade pan. In April 1957, when the figures for the first quarter showed a sharp fall from the previous year's level, their doubts seemed well founded—and further justified in October by a nine-month total still below the 1956 figure. But a last-minute spurt saw exports in the final quarter climb to a record £38m, carrying the 1957 total to £116m.

Best month of all was December, with exports at £17.5m, of which aircraft and spares contributed £12.6m and aero-engines £4.4m. (Each of these figures are records for any month.) Table 1, showing the principal countries to which our exports were directed, reveals how these records were achieved. India alone purchased in December almost £5m worth of aircraft, primarily Hunters, Canberras and Viscounts, and probably between one and two million pounds' worth of engines and equipment. December also saw Viscounts delivered to the Netherlands, and Britannias to Israel and Mexico.

The main credit for the 1957 records must go to engine manufacturers. Rolls-Royce exports jumped by £8m from £21m in 1956 to £29m in 1957. The increase in export value of all aero-engines from £28m to £41m shows that other engine manufacturers increased their exports by about £5m.

As a result of falling defence demands, the total export value of military aircraft dropped last year. At the same time, civil exports rose to over £50m, despite a slight fall in Vickers Viscount foreign sales from £29m to £27m.

Manufacturers of components and accessories also broke all records, with exports of electrical equipment and of instruments for the first time reaching £3m and £2m respectively, and despatch of tyres approaching £1m.

Distribution of exports over various regions and countries appears to follow no regular pattern. The British Commonwealth tends to receive about one-third of U.K. exports, with Australia and Canada being the leading regular customers. Prospects of European economic integration give added significance to that region's aeronautical imports from Great Britain. These fell from 1952 to 1955 (value of complete aircraft dropping from £15m to £10m) but have subsequently been rising steadily, last year showing the value of aircraft and parts to have reached £20m. Despite the growth of their own aircraft industries, the Netherlands, Sweden, France and Belgium continue to be our major European customers. Only in recent years has the United States become a leading importer of British aeronautical products. Although exports to the U.S. in 1958 are unlikely to reach the record £20m attained in 1956 (by reason of Capital Airlines' Viscounts), this year's figure should be over £10m, with planned deliveries including 15 Viscount 812s to Continental Air Lines and five Britannia 305s to Northeast Airlines.

Comparing the U.K. aviation industry with that of the U.S., total British exports are between one-third and one-quarter of U.S. exports, a proportion in line with total employment in each country's aircraft industry. Britain, however, exports a much higher proportion of its total aircraft output. (Precise figures are not yet available, but whereas the U.S. industry normally exports about one-eighth, here the proportion is almost one-quarter.)

Aeronautical products form a growing proportion of total British exports. This trend is typical of British engineering products generally, the value of these items having increased from one-third of total exports immediately after the war to two-fifths at present. Aero exports constituted less than 2 per cent of total U.K. exports until 1952, but in the last two years have exceeded 3 per cent. Related to total engineering exports, the value of aero exports has increased from 5 per cent prior to 1953 to over 8 per cent today.

Statistics describing Britain's foreign trade in aircraft often ignore the import side of the picture. Total aero imports are normally between one-third and one-quarter of comparable exports, and fluctuate around £25m per annum. Purchase of American aircraft by B.O.A.C. is a large item, the most recent such import having been ten DC-7Cs and spares valued at £10m; and an impending instance will be the importation of 15 Boeing 707s in 1961 at a dollar cost equivalent to £44m.

TABLE I: EXPORT OF AIRCRAFT AND PARTS TO COUNTRIES, 1955–1957

	Annual value (£ × million) 1955	1956	1957	Value (£ × 1,000) December 1957
Commonwealth:—				
Australia	2.3	11.0	2.9	192
Canada	5.2	1.9	3.9	854
India	1.2	1.2	11.0	4,791
New Zealand	0.9	1.3	0.9	73
Pakistan	1.7	0.5	0.2	5
Rhodesia	1.1	1.9	0.2	11
South Africa	1.1	0.2	0.4	42
Others	2.3	1.4	3.1	697
United States:—	3.0	17.2	5.1	240
Europe:—				
Belgium	2.2	2.9	1.4	51
France	2.6	3.1	3.1	203
Netherlands	2.6	2.4	6.0	1,486
Norway	0.1	0.2	0.9	2
Sweden	1.8	7.8	5.6	58
West Germany	0.3	0.3	1.9	332
Middle East:—				
Egypt	2.0	1.3	—	3
Iraq	1.6	0.4	0.9	14
Israel	0.4	0.2	3.0	986
Lebanon	1.8	0.4	2.5	348
Elsewhere:—				
Brazil	0.1	—	0.6	22
Burma	0.5	0.1	1.1	37
Total Commonwealth	15.8	19.4	22.6	6,665
Total Foreign	23.8	52.4	47.2	5,966
Total all countries	39.6	71.8	69.8	12,631

TABLE II: ANNUAL VALUE OF U.K. AERO EXPORTS AND IMPORTS, 1952–1957 (£ × MILLION)

	1952	1953	1954	1955	1956	1957
Exports:—						
Aircraft and parts	35.3	42.3	31.4	39.7	71.8	69.8
Engines	8.7	20.3	20.9	22.3	28.0	40.6
Electrical equipment	1.5*	1.9	2.1	2.3	2.7	3.3
Instruments	0.7	1.2	1.2	1.4	1.4	2.0
Tyres	0.5	0.4	0.6	0.6	0.7	0.8
Total exports	46.7	66.1	56.2	66.3	104.6	116.5
Imports:—						
Aircraft	8.3	41.5	15.6	13.6	12.7	11.8
Engines	3.9	6.0	6.4	7.7	10.6	13.2
Electrical equipment	—	0.3	0.8	1.0	1.3*	1.5*
Tyres	—	—	0.1	0.1	0.1	0.1
Total imports	12.2	47.8	22.9	22.4	24.7	26.6
Imports re-exported:—						
Aircraft	0.9	0.9	0.7	2.4	N.A.	N.A.
Engines	1.3	1.9	1.4	1.5	3.4	4.4
Total re-exports	2.2	2.8	2.1	3.9	N.A.	N.A.

*Estimated.

A noticeable feature of aero imports is the high value of engines in relation to complete aircraft. Indeed, in 1957 engines were the largest single category of aero imports, amounting to over £13m. Leading foreign suppliers of engines in the past have been the United States, France and Sweden. The value of engine imports runs at about one-third of that for engine exports. With Canada as the main supplier, electrical equipment is now the fastest-growing item of Britain's aero-imports and is now valued at about one-half the value of electrical equipment exported from the U.K.

Aviation imports include an unknown proportion of military equipment brought into this country under schemes such as the Mutual Defense Assistance Program. This explains the high 1953 import figure, £36m of which represents the arrival of about 370 Avro Canada Sabres. Much of this imported equipment is subsequently shipped abroad and so constitutes a major portion of what are officially known as re-exported aeronautical imports. Although figures for aero-engines in this category have been published, those for aircraft in the last two years are still suppressed.

Despite the hopes expressed by spokesmen of the British industry (and a cautious optimism is no bad thing), it will be surprising if the 1957 level of exports can be maintained over the next few years. Vickers and Rolls-Royce together will be hard-pressed to achieve exports of £70m in this year and in 1959; and it is difficult to see other civil aeronautical exports in each year reaching £20m and £25m. An appraisal of civil exports between now and 1960 suggests that, unless military exports average £25m p.a., there is little likelihood of last year's record being broken in the immediate future unless fresh orders follow the recently announced Swiss purchase of 100 Hawker Hunters for £15m. J. C. S.

One GANNET is a team

The hunter-killer team, consisting of two aircraft, one searching and the other striking, passed into history when the Fairey Gannet joined Squadrons of the Royal Navy.

Each single Gannet can carry out an anti-submarine operation unaided, hunting down the underwater raider with search radar and striking it with homing torpedoes, depth charges, mines and rockets.

The range and endurance required of a sub-hunting aircraft are provided by the Armstrong-Siddeley Double Mamba, a propeller-turbine that consists of two engines in one installation. One half of the engine is shut down for maximum economical cruising. Two engines, developing a total of over 3,000 e.s.h.p., are available for attack and provide the twin engine safety that is a prerequisite for ocean patrols.

Already serving with the Royal Navy and the Royal Australian Navy, the Gannet is on order for Western Germany's Naval Air Arm.

FAIREY GANNET

Shore-based or carrier-borne
the Fairey Gannet is the most sophisticated concept
of an anti-submarine aircraft in the world

THE FAIREY AVIATION COMPANY LIMITED · HAYES · MIDDLESEX
ENGLAND · AUSTRALIA · CANADA

E

FLIGHT, 7 February 1958

An open letter

From: Air Marshal Sir John Whitley, K.B.E., C.B., D.S.O., A.F.C.

AIR MINISTRY (FR3),
ADASTRAL HOUSE,
THEOBALDS ROAD,
LONDON, W.C.1.

Dear Sir,

Suggesting a career is always a big responsibility - not least for parents with a son growing up. In the final analysis, the choice must lie with your son himself. But you can help him in his choice.

Here, therefore, are some facts about one career which is particularly attractive to an ambitious young man. I refer to a flying career in the Royal Air Force, about which there seem to be some misconceptions, at present.

First, let me assure you that flying will continue in the Royal Air Force for as far ahead as can be foreseen. The Royal Air Force has the prime responsibility for the air defence of this country. For young men therefore who are trained to tackle the problems of the air in the air, there will be more - not fewer - opportunities in the missile age. This is especially true of those who qualify now for a permanent or short service commission and come successfully through their Pilot's, Navigator's or Air Electronics Officer's training. In a service as complex and as forward-looking as the Royal Air Force, there is always a constant demand for the right kind of senior officers.

It is a well-paid job. In how many callings can a man of 25 earn £1,500 a year? It is a job of high responsibility. Quite apart from flying and its fascinating skills, there are the manifold duties of an officer; to men under him; in staff, liaison or training jobs; and perhaps, in high command.

You know yourself if your son has the character, intelligence and fitness for this magnificent (but exacting) life. If he is over 17½ and has G.C.E. or equivalent to the required standard, you may be doing him a service if you write to the Air Ministry for fuller information.

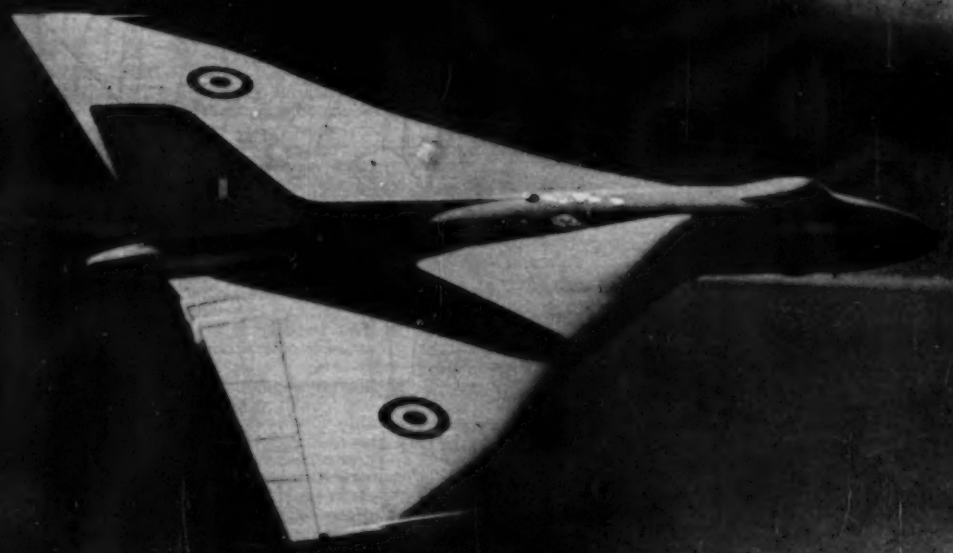
Let me add that the country needs the right kind of young men for this vitally important job, and it needs them now.

Yours faithfully,

Air Member for Personnel

To any young man who wants to fly . . .

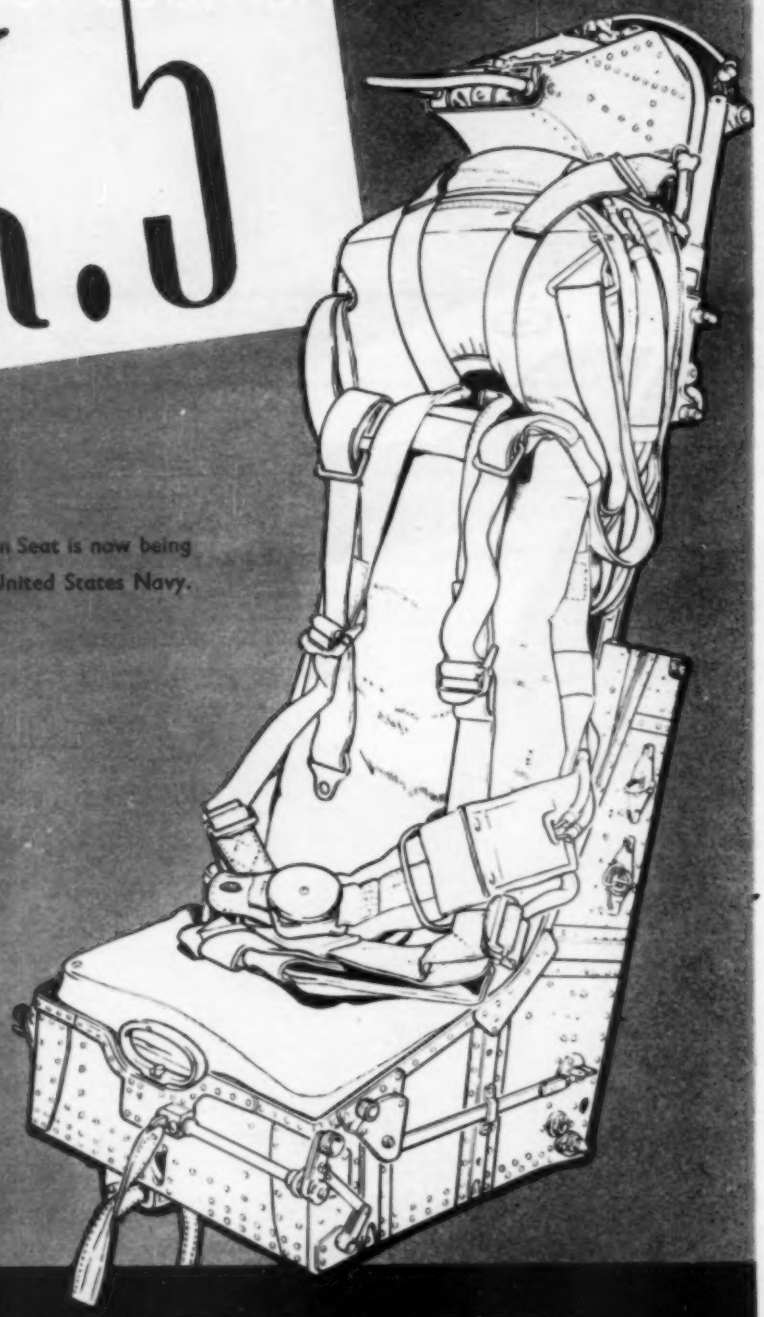
TO PARENTS OF AMBITIOUS YOUNG MEN



For further information write, stating age and educational qualifications, to : Air Ministry (FR3a), Adastral House, London, W.C.1.

Mk.5

The Martin-Baker Mk.5 Ejection Seat is now being delivered in quantity to the United States Navy.



MARTIN-BAKER

Aircraft Company Limited

England & Canada

The Spanish Aerotécnica AC.14 three-seat helicopter powered with a Turboméca Artouste II gas turbine.

AIRCRAFT INTELLIGENCE

U.S.A.

Convair F-106A Delta Dagger. Subject of our three-view drawing on this page, the F-106A is officially described as having the "most advanced electronic fire control and armament ever developed for an air force intercepter." This equipment, for which the prime contractor is Hughes Aircraft, represents about 30 per cent of the overall cost of the weapon system (i.e., probably about $350,000 per aircraft).

McDonnell F-101B. Now in service with the U.S.A.F. Air Defense Command, this version of the Voodoo can carry three Falcon (GAR-1, 2, 3 or 4) missiles on a rotatable weapon door as well as a pair of MB-1 Genie unguided nuclear air-to-air weapons. The latter are mounted externally and at the moment of firing are tilted downwards away from the carrier aircraft while the latter pulls up into a climb. Thus the flame from the Genie's motor falls rapidly away beneath the Voodoo and cannot enter the latter's intakes. Once well clear of the Voodoo the fins of the Genie flick open to provide stabilization.

North American B-110. It is now known that this will be the designation of the N.A.A. design which was successful in winning the WS-110A chemical-fuel bomber specification described in our issue of January 10. Mr. "Dutch" Kindelberger, president of North American, recently said "It gets nothing from any other aircraft experience. It is an entirely different aerodynamic concept, has new engines and operates at very high temperatures." It was recently announced that the principal contenders for the B-110 electrical system are Westinghouse and General Electric. It is generally considered that whereas the Boeing design submitted for the WS-110 competition was that of a relatively conventional aeroplane, the North American project is of a radical form and is designed to achieve a much higher performance.

France

Dassault Etendard IV. On January 18, in the course of its 24th flight, the first Etendard IV (SNECMA Atar turbojet) exceeded the world's closed-circuit speed record over 1,000 km. At the controls was Reserve Lt. Pierre Galland, a Government test pilot. The course was Istres-Cazaux-Istres and the average speed—officially recorded—was 633 m.p.h. The flight was made at a height of 24,600ft, above cloud, and Cazaux was identified by a representative of the Aero Club of France who (according to a French report) "was installed in another aircraft." On landing the Etendard still had several hundred litres of fuel in its tanks. It is claimed that this fighter/bomber climbs to 39,370ft in five minutes, takes off in 600 metres, lands in less than 400 metres, and has a turning circle at low altitude of less than 500 metres

Sud-Aviation Alouette II. Recent deliveries of Sud Alouette II turbine-powered helicopters include 12 for unspecified civil use; four to the Algerian Government; three to the Gendarmerie Nationale; one to Electricité de France; one to Gyrafrique; one to the Centre National d'Etudes et Télécommunications; and one to Montsouris films. Forty-two were despatched to the French Air Force; 26 to the Army; and 15 to the Navy. A total of 107 Alouette IIs has now been delivered, and the present rate of production is ten a month (four military, six civil).

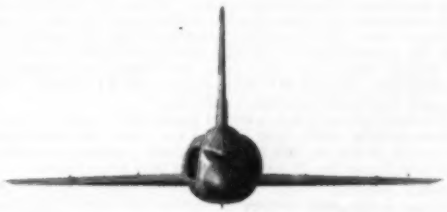
Czechoslovakia

Super Aero 45. The first consignment of ten Super Aero 45 cabin monoplanes has been despatched to Brazil and further large batches for Argentina and Egypt will be shipped within a few months.

Japan

T1F2 Trainer. Powered with the Bristol Orpheus turbojet Japan's first home-designed and home-built two-seat intermediate jet trainer—the T1F2 of Fuji Heavy Industries, Ltd.—made its first flight on January 19. The pilot was Colonel Takaoka, commander of the Experimental Air Unit, and he took the new trainer to 19,700ft in the course of a 27-min flight.

F-86D Delivery. Four North American F-86D all-weather fighters—the first of a batch of 60 scheduled to be supplied by the U.S.A. to the Japanese Air Self-Defense Force—were delivered into Japanese hands at a ceremony on January 16.

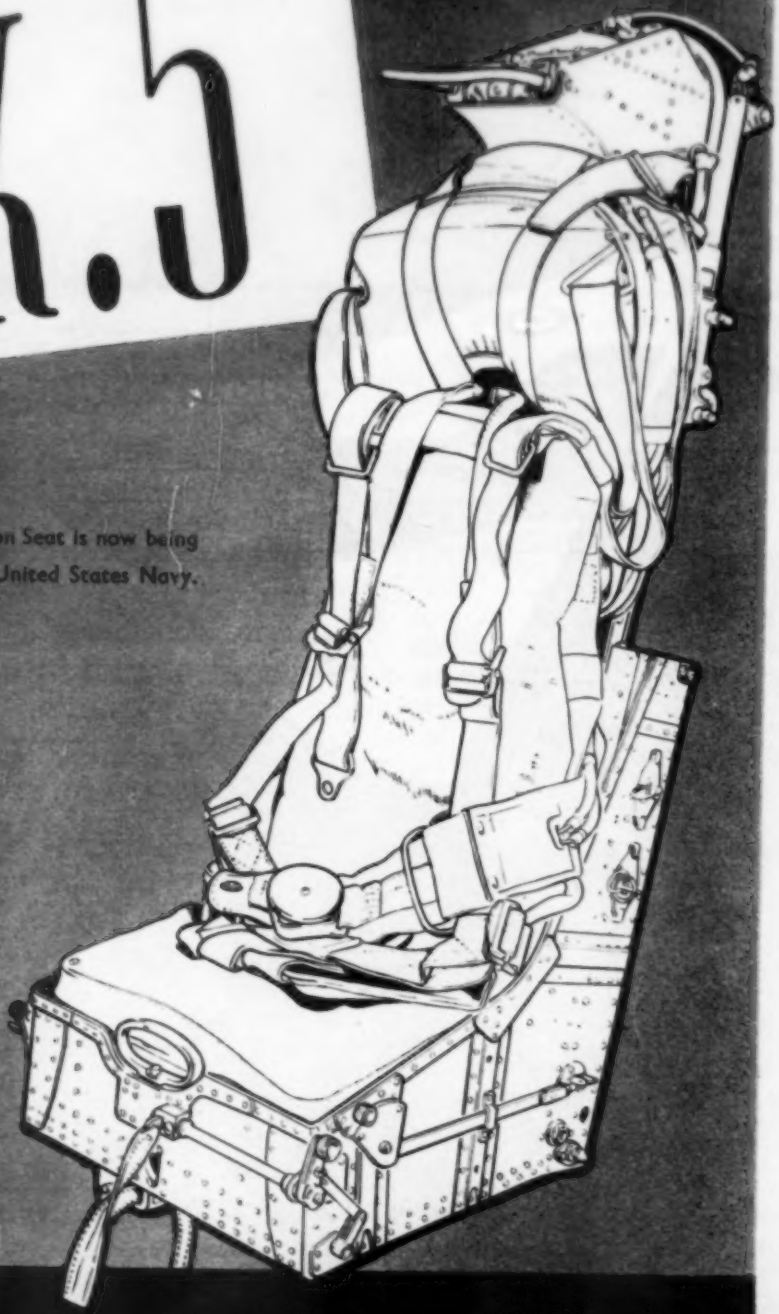


CONVAIR F-106A DELTA DAGGER
(Pratt and Whitney J75)

Span ... ... 38ft 2in approx.
Length ... ... 70ft approx.

Mk.5

The Martin-Baker Mk.5 Ejection Seat is now being delivered in quantity to the United States Navy.



MARTIN-BAKER

Aircraft Company Limited

England & Canada

The Spanish Aerotécnica AC.14 three-seat helicopter powered with a Turbomeca Artouste II gas turbine.

AIRCRAFT INTELLIGENCE

U.S.A.

Convair F-106A Delta Dagger. Subject of our three-view drawing on this page, the F-106A is officially described as having the "most advanced electronic fire control and armament ever developed for an air force intercepter." This equipment, for which the prime contractor is Hughes Aircraft, represents about 30 per cent of the overall cost of the weapon system (i.e., probably about $350,000 per aircraft).

McDonnell F-101B. Now in service with the U.S.A.F. Air Defense Command, this version of the Voodoo can carry three Falcon (GAR-1, 2, 3 or 4) missiles on a rotatable weapon door as well as a pair of MB-1 Genie unguided nuclear air-to-air weapons. The latter are mounted externally and at the moment of firing are tilted downwards away from the carrier aircraft while the latter pulls up into a climb. Thus the flame from the Genie's motor falls rapidly away beneath the Voodoo and cannot enter the latter's intakes. Once well clear of the Voodoo the fins of the Genie flick open to provide stabilization.

North American B-110. It is now known that this will be the designation of the N.A.A. design which was successful in winning the WS-110A chemical-fuel bomber specification described in our issue of January 10. Mr. "Dutch" Kindelberger, president of North American, recently said "It gets nothing from any other aircraft experience. It is an entirely different aerodynamic concept, has new engines and operates at very high temperatures." It was recently announced that the principal contenders for the B-110 electrical system are Westinghouse and General Electric. It is generally considered that whereas the Boeing design submitted for the WS-110 competition was that of a relatively conventional aeroplane, the North American project is of a radical form and is designed to achieve a much higher performance.

France

Dassault Etendard IV. On January 18, in the course of its 24th flight, the first Etendard IV (SNECMA Atar turbojet) exceeded the world's closed-circuit speed record over 1,000 km. At the controls was Reserve Lt. Pierre Galland, a Government test pilot. The course was Istres-Cazaux-Istres and the average speed—officially recorded—was 633 m.p.h. The flight was made at a height of 24,600ft, above cloud, and Cazaux was identified by a representative of the Aero Club of France who (according to a French report) "was installed in another aircraft." On landing the Etendard still had several hundred litres of fuel in its tanks. It is claimed that this fighter/bomber climbs to 39,370ft in five minutes, takes off in 600 metres, lands in less than 400 metres, and has a turning circle at low altitude of less than 500 metres

Sud-Aviation Alouette II. Recent deliveries of Sud Alouette II turbine-powered helicopters include 12 for unspecified civil use; four to the Algerian Government; three to the Gendarmerie Nationale; one to Electricité de France; one to Gyrafrique; one to the Centre National d'Etudes et Télécommunications; and one to Montsouris films. Forty-two were despatched to the French Air Force; 26 to the Army; and 15 to the Navy. A total of 107 Alouette IIs has now been delivered, and the present rate of production is ten a month (four military, six civil).

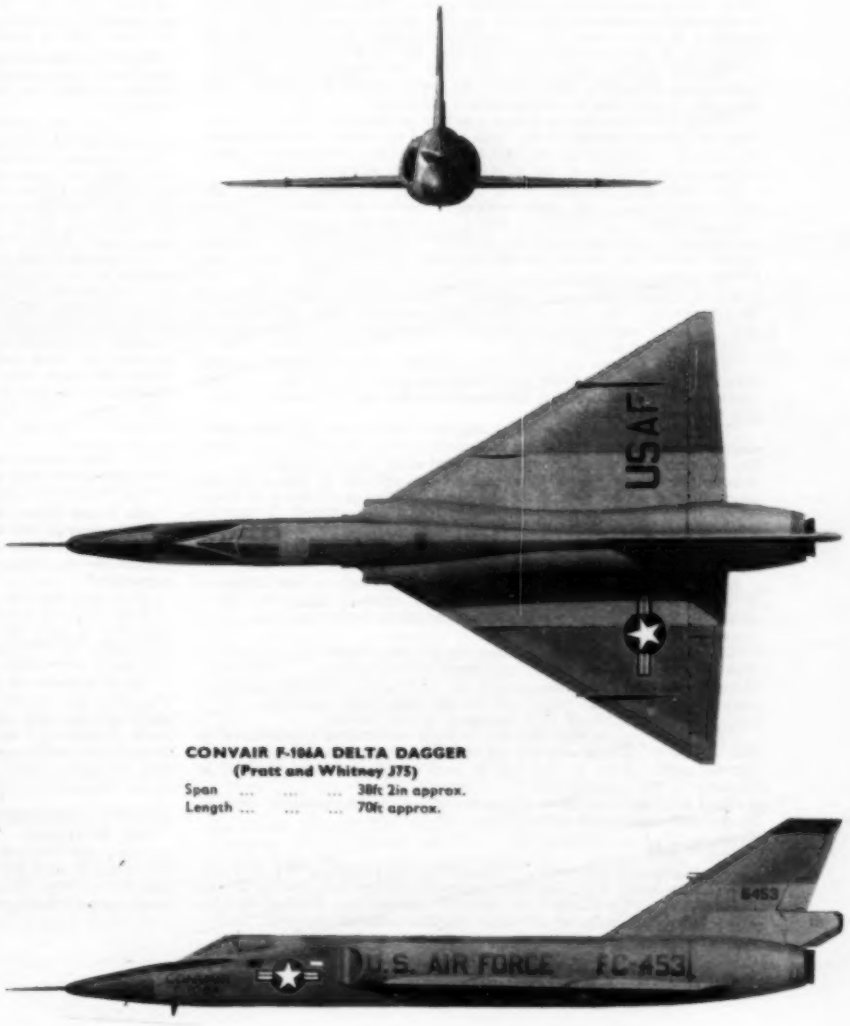
Czechoslovakia

Super Aero 45. The first consignment of ten Super Aero 45 cabin monoplanes has been despatched to Brazil and further large batches for Argentina and Egypt will be shipped within a few months.

Japan

T1F2 Trainer. Powered with the Bristol Orpheus turbojet Japan's first home-designed and home-built two-seat intermediate jet trainer—the T1F2 of Fuji Heavy Industries, Ltd.—made its first flight on January 19. The pilot was Colonel Takaoka, commander of the Experimental Air Unit, and he took the new trainer to 19,700ft in the course of a 27-min flight.

F-86D Delivery. Four North American F-86D all-weather fighters—the first of a batch of 60 scheduled to be supplied by the U.S.A. to the Japanese Air Self-Defense Force—were delivered into Japanese hands at a ceremony on January 16.



CONVAIR F-106A DELTA DAGGER
(Pratt and Whitney J75)

Span ... ... 38ft 2in approx.
Length ... ... 70ft approx.

Parliament Debates Civil Aviation

Points from the Speeches

EVERY year Parliament "takes note" of the Reports and Accounts of the two British air Corporations in what has come to be known as the annual Civil Aviation Debate. The occasion is inevitably one in which the whole field of British civil aviation is discussed. Here *Flight* summarizes this year's debate, which took place on January 27. For quick reference, the chronological sequence has been adjusted in order to group selected pertinent remarks under specific headings.

The Corporations' Reports and Accounts

MR. HAROLD WATKINSON (Minister of Transport and Civil Aviation): "The B.O.A.C. story at the moment is not so encouraging [as that of B.E.A.]. One sees clearly the disadvantages of not having the right tools for the job at the right moment. It is a hard fact that the Corporation's position . . . has been much affected by the fact that it has been operating obsolescent aircraft.

"Nobody regrets the fact that the Britannia [102] did not enter service on time any more than the Bristol Aircraft Company, but it is my duty to the Corporation to explain the reason for B.O.A.C.'s financial results."

"The Corporation's unit costs rose to 39.9d per capacity ton-mile, and although it did well in some ways, we have to recognize that passengers carried increased by only 7 per cent, as compared with the world increase of 15 per cent."

"I must not lead the House to believe that B.O.A.C. will have a good financial year [ending March 31, 1958], because it will not. I had talks with the Chairman . . . and we agreed that the Corporation must now make a great attempt to cut down its internal costs. These are very high, and to put its financial position right, a constructive effort must be made to do it."

"I think that any hon. Members who have travelled in the Britannia aircraft will agree that the Corporation gives better service than any other airline in the world."

MR. G. R. STRAUSS (Lab., Vauxhall): "The future of civil aviation depends far more on providing seats in aeroplanes which are cheap rather than in providing aircraft which are fast. What really is important is to provide aeroplanes in which accommodation can be sold by the thousand at cheap rates. The operating companies that will succeed in doing that to the greatest extent will lead the world in civil aviation."

"Whereas B.E.A. totals costs [for sales, advertising and publicity] went up by £250,000, those of B.O.A.C. went up by £1 million. The difference is such that an explanation is called for."

"Either the statements in B.E.A.'s report [to the effect that the independent airlines diverted traffic from B.E.A.] are untrue, in which case the Minister ought to say so, and he denies them completely; or they are agreed, in which case the Minister ought to take some action."

MR. CLEDWYN HUGHES (Lab. Anglesey): "I would remind the House that Wales is the only country in Europe this side of the Iron Curtain which is not served by B.E.A. . . . I do not underestimate the contribution made by Cambrian Airways . . . but we need two basic regular services in Wales, one in the south and one in the north, run by the public Corporation."

MR. IAN MIKARDO (Lab., Reading): "The B.E.A. accounts show that during the year the Corporation's bank loan rose from £500,000 to £1½ million. I should very much like to know what rate of interest the Corporation has to pay on that."

"The bank balance for B.O.A.C. is shown in the Report at no less than £10.8 million. I have gone closely through the accounts . . . but nowhere can I find anything that indicates what the Corporation has to pay in interest on its loan."

"There have been examples of efficiency being lowered, and public money being wasted, through too fierce a passion in each Corporation for independence and self-sufficiency, and even empire-building . . . I believe there *is* a *prima facie* case—I do not put it higher at the moment—for saying that there are much greater possibilities of more action [and more co-operation between the Corporations]. I have in mind some aspects of provisioning and store-keeping, personnel recruitment, training, seconding and exchange, medical services, surface transport, . . . and sales."

MR. AIREY NEAVE (Joint Parliamentary Secretary to the Ministry of Transport and Civil Aviation): "B.O.A.C. has now decided to return to those [South American] routes and hopes to make a beginning, to Caracas, in the autumn of this year."

"It is fair to say that B.E.A. does not give any details of the material diversions of traffic [by the independents] which it alleges . . . that being the position, and Parliament having set up the Air Transport Advisory Council as an impartial body, I do not see what I have to answer. There are, in fact, no details of what is said to be the damage."

"The main reason [for B.O.A.C.'s high advertising expenditure] is that B.O.A.C. planned a much increased advertising campaign to build up the traffic which it expected to need to fill the large increase in capacity in the ensuing year."

"B.O.A.C. will be offering nearly half of its transatlantic capacity in the new economy fare class."

B.E.A.'s Jet

MR. HAROLD WATKINSON: "I think that the history of B.E.A.'s attitude was, to begin with, that the Corporation rather favoured the Bristol concept but, after discussion and technical examination, the final decision of its Board was in favour of the de Havilland design concept."

"I do not think there is now any aircraft manufacturer who has not had a chance of associating himself with this order if he wants to."

"The final detailed proposals from the de Havilland group and its associates reached my right hon. friend and myself only this morning. They are being urgently examined. I hope that in the next few days we shall know how the Bristol-Hawker Siddeley group has got on in America, which will show us the world's reaction to this kind of aircraft, and we shall have a clearer knowledge of the basis on which the de Havilland offer is made. We shall have the benefit of the technical examination which B.E.A. is making into that project, both as to finance and production capacity. As I said in the House last week, as soon as those two matters are clear a decision will be taken and it will be announced."

"It is the view of de Havilland's and their associates that they would prefer to do their selling overseas when they are a little further forward with their combination of companies, and I think they want to try to obtain the B.E.A. order first. It is a free world and, of course, they can do what they like."

"There is a view that it is sometimes a mistake to tell possible competitors—of course, the Americans are competitors with us in this sphere—too much about a new kind of aircraft."

MR. STRAUSS: "Once we have a joint company carrying out a project, there is always a danger of blurred responsibility and loyalties and it is often, though not always, not satisfactory."

"To set up a joint company . . . does not bring us any nearer to that complete concentration which means amalgamation of companies, when we have one leadership and control. That is not taking place here."

"The Minister will have to have a very strong case supported by convincing facts if he is to insist upon the Corporation giving the order to a group other than that which it wants. The Minister is entitled to take such a decision in certain circumstances, but, in the present case I do not see how he could be right in doing so."

"I do not think that the sending of this Bristol 200 team to the United States is relevant to the situation at all. De Havilland could also, if they wanted, send out a selling team to the United States. Just because one group has rushed in and sent a selling team to the United States, where we know they will undoubtedly receive a friendly response—because the Americans are very friendly and hospitable—the Government should not in any way be biased in its favour."

LORD BALNIEL (Con., Hertford): "Is not B.E.A. completely satisfied that those [Airco] production facilities are quite adequate? Is not B.E.A. equally satisfied that the financial strength of the company is completely adequate?"

"It would not commend an aircraft to overseas airline operators if it were known that B.E.A. were forced to buy it against its wish."

SIR ARTHUR VERE HARVEY (Con., Macclesfield): "I think the Minister of Supply has been influenced by the civil servants who surround him at Shell-Mex House [i.e., at the Ministry of Supply]. My experience of them does not lead me to say that they are the most efficient people in this business. There are some very good people there, but there are also a great number of third-raters."

"I recognize that the Treasury and my right hon. Friend have got a weapon in dealing with contracts, but what is the result? There has been squabbling and bickering and, I would go so far as to say, some double dealing [hon. Members: "Oh!"] That is my information. Although I am not going to give the facts. The plan to bring three firms together, which was the intention three weeks ago, is quite impossible. It does not work out in practice. Imagine throwing together design teams who have been built up over a period of years. Imagine them suddenly being told that they have got to work with another team eighty miles away. They would be looking over their shoulders for the first two years. I am sure it would not work. It would not help the industry or the project."

". . . the original agreements between the Bristol Company and de Havillands were torn up in the middle of negotiations and then the other two got together. I think it is probably best to leave it at that."

MR. FAREY-JONES (Con., Watford): "I want to place on record that I have the gravest fear of gunshot [*sic*] marriages that apparently are taking place behind the scenes at the present time, because therein lies a menace to the future of civil aviation and to a number of other industries."

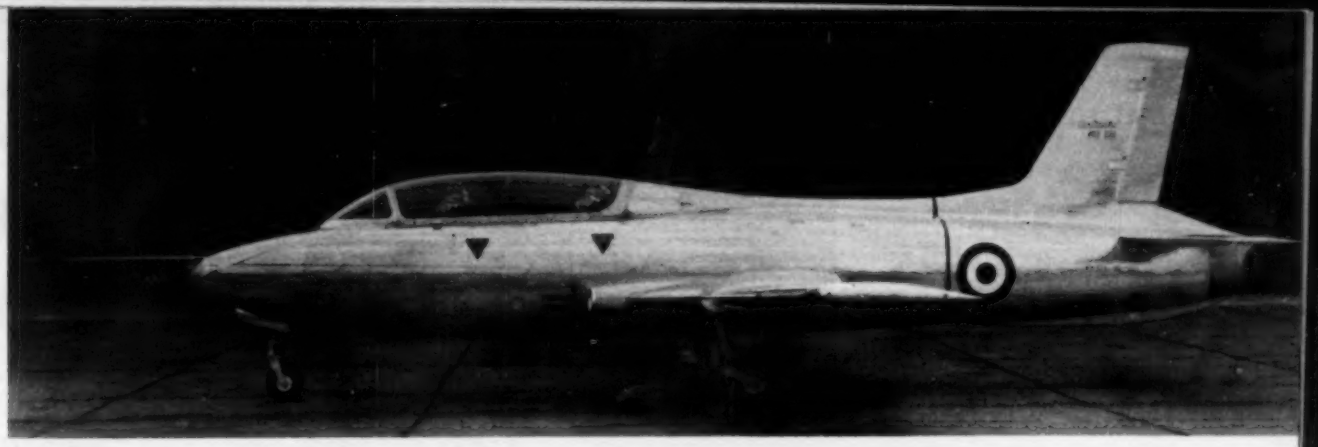
"But, good heavens, what a terrific mistake this House would be guilty of if we said to a nationalized corporation or to a private enterprise concern that it must use the equipment which a buffoon—I said buffoon not boffin—in Whitehall said it should use. I hope my hon. Friends will never be a party to that."

MR. MIKARDO: "I would draw attention to the very strong and serious allegation that he [Sir Arthur Harvey] has made of double-dealing . . . I have said that the industry was incompetent; I have said that it was badly organized; I have said that it was very greedy; I have said that its particular efficiency has been in the design, development and production of sales baloney; but I have never said, as the hon. Member did, that it was guilty of double dealing."

B.O.A.C.'s Britannias

MR. WATKINSON: "This work of curing the Britannia's engine icing problem has received little notice: there has been plenty of criticism when things have gone wrong, but not so much praise for the scientists and others who have been working night and day, for seven days a week, to get things put right . . . They were working under great difficul-

[*Continued on page 190*]



MACCHI MB.326

REPRODUCED on this page is the first flying picture of the prototype Aeronautica Macchi MB.326, which, in the hands of Commandante Carestiati, made its first flight on December 10.

A brief general description appeared in *Flight* for September 21, 1956, and the inboard profile drawing below shows principal details of construction and installations. The rear fuselage is detachable for engine removal—the painted vertical line visible in the heading photograph indicates the break point.

Critical Mach number is 0.8, and service ceiling is stated to be 39,090ft—the cockpit is air-conditioned and pressurized. Stalling speed, flaps down, is 80 m.p.h. (these figures refer to the unarmed version). Provision is made for pressure refuelling, which can be completed in four to five minutes. On production machines U.H.F. radio will be standard equipment.

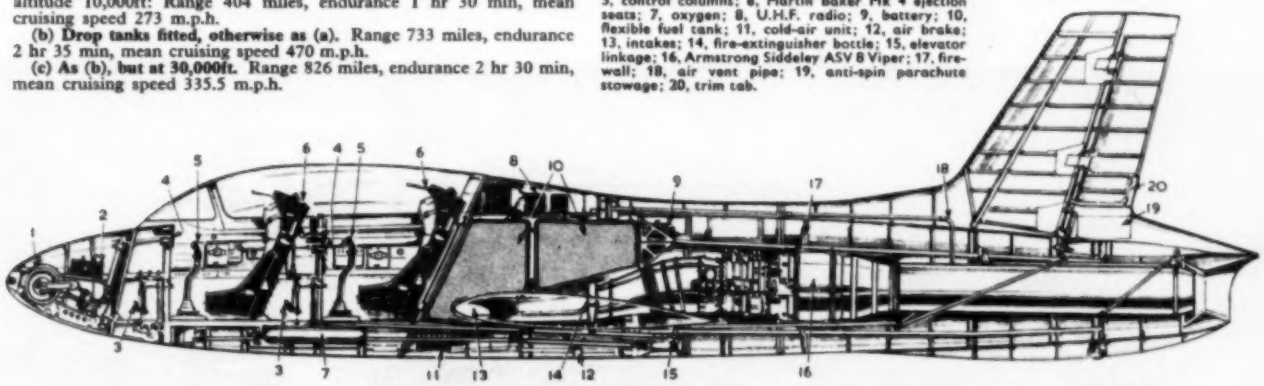
Some typical missions given by the makers are:—

(a) Without drop tanks. Taxying, take-off, climb, level flight at optimum economical airspeed, descent, with 5 per cent fuel reserve, flight altitude 10,000ft: Range 404 miles, endurance 1 hr 30 min, mean cruising speed 273 m.p.h.

(b) Drop tanks fitted, otherwise as (a). Range 733 miles, endurance 2 hr 35 min, mean cruising speed 470 m.p.h.

(c) As (b), but at 30,000ft. Range 826 miles, endurance 2 hr 30 min, mean cruising speed 335.5 m.p.h.

Key to drawing: 1, Nosewheel; 2, A.D.F.; 3, adjustable rudder pedals; 4, instrument panels; 5, control columns; 6, Martin Baker Mk 4 ejection seats; 7, oxygen; 8, U.H.F. radio; 9, battery; 10, flexible fuel tank; 11, cold-air unit; 12, air brake; 13, intakes; 14, fire-extinguisher bottle; 15, elevator linkage; 16, Armstrong Siddeley ASV 8 Viper; 17, firewall; 18, air vent pipe; 19, anti-spin parachute stowage; 20, trim tab.



FIAT G91 FOR NATO?

ACCORDING to Italian reports, a NATO production contract for the Fiat G91 is imminent. The G91A version, described below, would be built by Fiat and probably by a German company also. The NATO order is also reported to call for a three-stage programme over several years. The G91A would first be produced, followed by the winner of a new competition for developed versions of the G91, Dassault Etendard and Bréguet Taon powered by the Bristol Orpheus BOr.12. Finally, some time after 1962, a VTOL or STOL fighter, for which the specification has not yet been finalized, would be produced.

Considerable interest is being shown in the G91. Last May a Turkish technical mission visited Fiat and several Turkish pilots have just flown the aircraft at Turin, presaging a possible Turkish Air Force order. Last month a similar mission, headed by Herr F. J. Strauss, the West German Defence Minister, visited Fiat and this visit was also followed-up by a team of pilots from Germany. They are reported to have been impressed by their flights, which included take-offs and landings on unprepared ground.

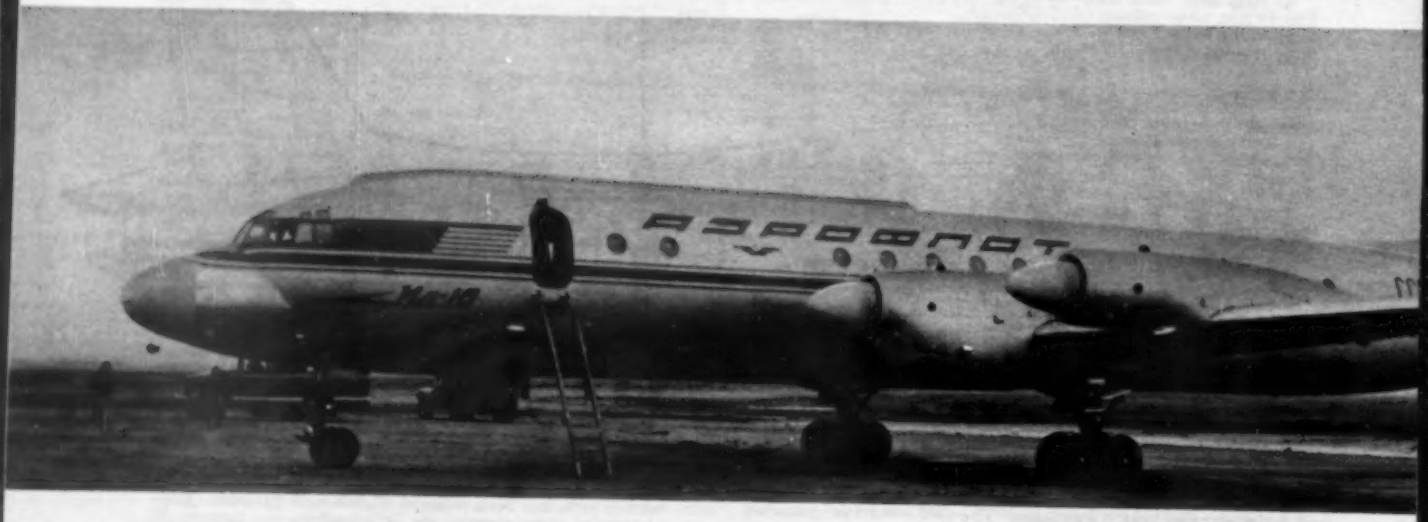
The G91A differs from its predecessor mainly in the addition of automatic leading-edge slats, and integral wing tanks totalling just short of 80 Imp. gal. capacity (the latter made possible, say Fiat, by sealing processes developed in the U.S.A.). Wing span has been increased to 29ft 6in, giving an additional 17 sq ft wing area, but t/c ratio has been reduced slightly to 9 per cent. Pull-out and turning characteristics are improved by the increase in obtainable load factor for a given speed.

Gross weight, "clean," will be about 11,240 lb—an increase of approximately 880 lb, of which about 660 lb is due to the additional fuel load and the remainder to structural alterations.

Maximum level Mach remains at 0.92, but other significant changes in performance are claimed—notably a reduction of about 25 per cent in take-off distance, which is now estimated at 2,000ft, and 1,575ft, respectively with and without external stores. The additional tankage will increase the cruising range by about ten per cent. Fiat are also offering the G91R (Reconnaissance) and G91T (Trainer).

Less information is available concerning the more embryonic G91S. The powerplant will be the Bristol BOr.12, giving 6,800 lb dry thrust, though Fiat would naturally like to replace this eventually with Fiat 4032, an axial turbojet comparable to later marks of Orpheus but having three bearings. Sweep-back will be increased to 38 deg and t/c ratio further decreased to 8 per cent. No performance data have been released except an estimated level Mach number of 0.94; gross weight will be 12,790 lb.

TURBOPROP CONTENDE



RS — AN INTERNATIONAL TRIO

VICKERS' Vanguard, Lockheed's Electra, Ilyushin's Moscow—depicted here is the short/medium-haul turboprop transport challenge to the rival turbojet philosophy. All three types have a superficial similarity, and all bear a subtle but distinctive national stamp.

The Electra, America's first production turboprop airliner, is the smallest of the three. While the prototype (above, left) continued its flight-test programme, the second aircraft (top right) was rolled out three weeks ahead of schedule; its maiden-flight deadline is March 31. Delivery of the first machine to Eastern Air Lines, should take place in September.

On the left are two new photographs of Russia's dolphin-nosed Il-18 Moscow, now in the markings of Aeroflot. First of the trio to fly, it is expected to go into airline service this summer. Largest of the three is the Vanguard (above), which should fly in October and enter B.E.A. service in March 1960; it is worth recalling that it is Great Britain's third production turboprop and the second from the Vickers stable which reared the Viscount family.

SPECTRE A.T.O. UNIT

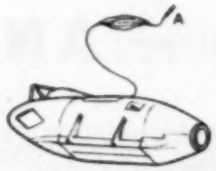
A Recoverable Rocket Motor for Victors and Vulcans

TODAY it becomes permissible to publish basic particulars of the special version of the de Havilland Engine Company's Spectre liquid-propellant rocket motor which has been developed for use as an assisted-take-off boost unit, together with details of the nacelle in which it is mounted. As far as can be determined, no other nation or manufacturer has yet succeeded in producing a recoverable A.T.O. unit of this type. The requirements for such a device are exceedingly severe: the pack must be mounted properly on its carrier aircraft to produce thrust along the correct axis without incurring any change in aircraft trim; it must be releasable at a high indicated airspeed, leaving the aircraft cleanly and being decelerated and finally brought to rest on the ground by some form of parachute and shock-absorber system; it must then be capable of being inspected, refuelled and used again—a considerable number of times.

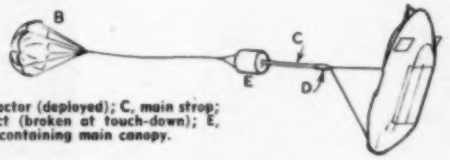
Before discussing the A.T.O. pack as a whole, it is appropriate to say something about the rocket motor itself. It may be remembered that the Spectre was preceded by a smaller unit named the Super Sprite; the latter, which was not pump fed, was fully described in our issue of August 5, 1955. Compared with the Super Sprite, the Spectre has an appreciably larger chamber, indicative of greatly increased thrust, and it is fed with propellants from remote tankage by turbopumps driven by the propellants themselves. The first type of Spectre to be publicly revealed was a version suitable for permanent installation as a primary powerplant of a manned aeroplane. As we stated in our description of this unit, in our issue of August 23, 1957, this type of Spectre is controllable over an exceedingly wide range of thrusts. First-hand impressions of a firing of this type of Spectre were published in our issue of August 30, 1957. A fully controllable Spectre powers the Saunders-Roe SR.53 prototypes and a later version would have fitted the SR.177.

Compared with these "sophisticated" Spectres, the A.T.O. unit is naturally less complicated. As a primary powerplant for an intercepter the Spectre has to be capable of sustained flight under extreme conditions of positive and negative g at altitudes up to at least 100,000ft. In contrast, the conditions governing the design of an A.T.O. motor are more fully known and are nothing like so severe: possible limits for speed and altitude would be 250/300 knots and 2,500ft or less, and it is likely that the motor could be designed to give constant thrust and that the negative-g requirement could be eliminated. As a photograph on p. 179 emphasizes, the A.T.O. Spectre is remarkably "clean," the pumps and accessories being dwarfed by the big cylindrical combustion-chamber casing. The latter is clearly the same as that of the SR.53 engine, but the pump sizes have been reduced (apparently while maintaining the original rates of flow) and the oil sump and accessories are smaller and simpler. Control is effected by a simple open/shut linkage moved by a Western Manufacturing rotary actuator connected through tie-rods to the nitrogen valve (to provide initial propellant feed during the starting cycle) and to the H.T.P. (high-test peroxide) feed to the turbopump.

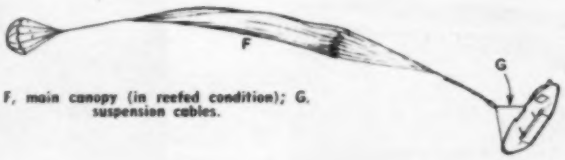
There is little more that can be said about the motor itself, but the nacelle can be discussed in some detail. One cannot help contrasting the nacelle with that previously developed by de Havilland Engines for the Super Sprite. The latter, which is used on the Valiant, contained a number of compromises which,



After release from the aircraft a time delay fires the extractor gun in 1.8 to 2.0 sec and deploys the sock (A) containing the vane-type extractor.



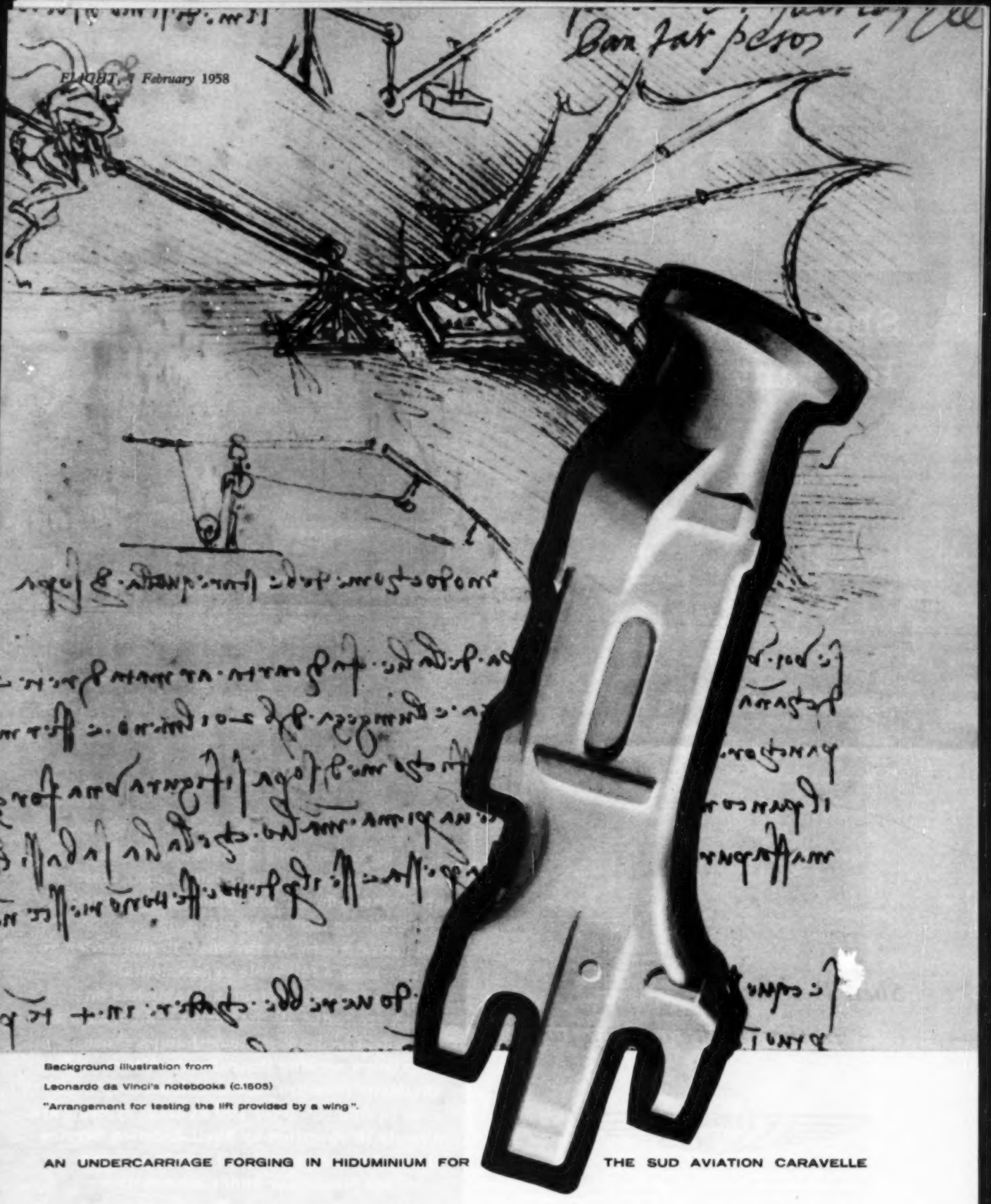
B, vane extractor (deployed); C, main strop; D, disconnect (broken at touch-down); E, pack containing main canopy.



F, main canopy (in reefed condition); G, suspension cables.

Dropping trials with the Spectre A.T.O. unit were carried out with a Bristol Brigand, operating from the A. and A.E.E., Boscombe Down.

In steady descent the main canopy (F) and air-cushion bag (H) are both fully inflated. The nacelle is suspended in the horizontal position and, upon landing, the air-cushion disconnect releases the main canopy.

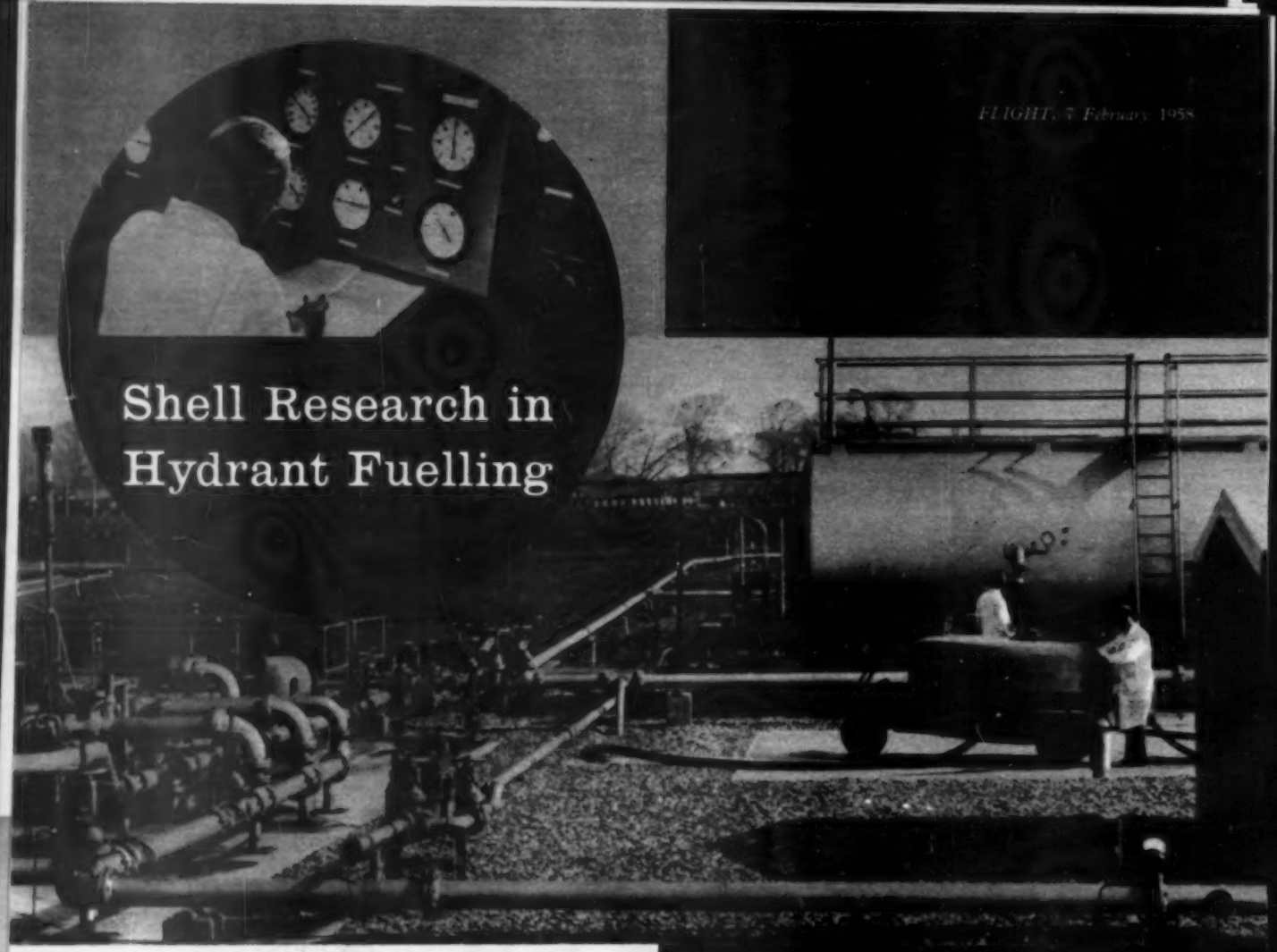


Background illustration from
Leonardo da Vinci's notebooks (c.1505)
"Arrangement for testing the lift provided by a wing".

AN UNDERCARRIAGE FORGING IN HIDUMINIUM FOR THE SUD AVIATION CARAVELLE

Hiduminium makes the most of *Aluminium*

HIGH DUTY ALLOYS LTD · SLOUGH · BUCKS

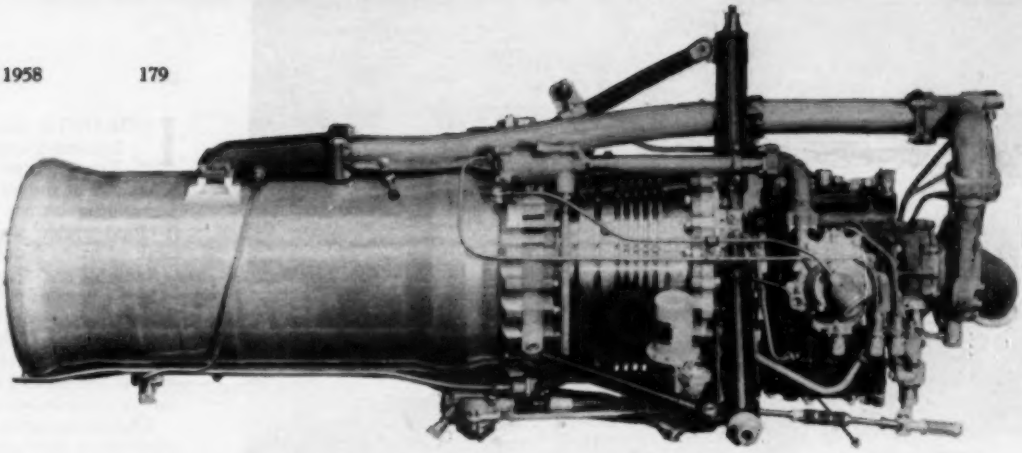


Shell Research in Hydrant Fuelling

Shell Research
in the Service of Aviation

SHELL

Fuelling the airlines of the world is our business and the provision of the most up-to-date, efficient and economical methods of delivering fuel to aircraft is our constant concern. At the Shell Research Centre at Thornton, a full-scale experimental hydrant fuelling system is established on which are tested all the varied components of an airfield hydrant system – pumps, shock alleviators, sensing instruments, filters, automatic pressure valves, unions, couplings, hose equipment. Over 100 hydrant systems are already in operation by Shell Aviation Service throughout the world and nearly as many more are planned or under construction at airfields where they offer economic and operational advantages to the airlines.



Seen here from the right-hand side (nozzle pointing to the left) the A.T.O. Spectre is an extremely neat motor. On the right are the H.T.P. and fuel pumps, the former feeding to the chamber cooling jacket.

SPECTRE A.T.O. UNIT...

although in no way impairing the efficiency of the unit, made it somewhat heavier and bulkier than it need otherwise have been. Compared with the Super Sprite nacelle, the Spectre pack is considerably more efficient, reflecting the company's experience in this field (which is not approached by that of any other manufacturer in the Western world). The Spectre nacelle is, in fact, no larger than that required to house the Super Sprite and it seems fair to deduce that neither is its weight any greater.

As the photograph at the head of p. 178 demonstrates, the Spectre is mounted within a streamlined nacelle generally manufactured in stressed L.72 skin. The principal structural members are a continuous flat floor and two strong bulkheads.

At the front is the H.T.P. tank. This takes the form of a double-skinned box housing a flexible bag of polythene or p.v.c., the latter housing the oxident itself and being pressurized at from 12 to 15 lb/sq in by a nitrogen system to provide a starting feed and also prevent pump-cavitation. On the upper centreline is a glass-fibre fairing over the pressurizing and vent valves, suspension link, thrust spigot, and (when the nacelle is mounted on the Victor) the anchorage for the stabilizing crutch. In the centre is a stainless-steel cylinder housing the kerosine, above which is a glass-fibre pan carrying the main parachute canopy. At the rear is the Spectre motor, which is mounted on lateral Metalastik bushes with an upper third point in the form of a turnbuckle-type link with which the thrust-line can be accurately aligned. Along the bottom of the nacelle is the removable box housing the air bag, which provides a cushion upon which the whole assembly lands.

For use, the nacelle is taken from store, wheeled out and clipped beneath the wing of a Victor or Vulcan (two nacelles per aircraft). D.H. Engines deliver the nacelle as a standard unit with four sets of lifting points, two suitable for the Vulcan and two suitable for the Victor. For the latter aircraft a triangular crutch is employed, as shown in the photograph; for the Vulcan there are two feet, cast in magnesium alloy and surmounted by rubber shock pads, mounted on either side of the upper forward part of the nacelle. When slung beneath the aircraft the weight of the nacelle is taken by a steel link above the bulkhead behind the H.T.P. tank. Thrust from the motor is transmitted through a spigot in S.96 steel mounted further forward.

When the nacelle is installed on the aircraft, the negative-incidence stabilizing fins—which are folded upwards for storage—can be hinged downwards and secured by pins in the spread position (these pins are weak links so that, should the nacelle roll over upon landing, the pin can shear and prevent airframe damage). H.T.P. is supplied through an Avery-Hardoll filler in the extreme nose of the nacelle. The kerosine filler is a conventional socket on the left-hand side of the nacelle, feeding through a flexible pipe. The nitrogen bottles, of which there are four mounted around the kerosine tank, are charged to 3,000 lb/sq in through Dzus-fastened panels on the left-hand side of the nacelle. Access to the motor can be gained by undoing four King Aircraft fasteners and removing the two-section access door over the rear of the nacelle.

Firing of the two Spectre nacelles takes place during the take-off run, and, when the bomber has reached the appropriate height and speed, the pilot can release the nacelles over the prescribed dropping point. The jettison sequence is shown in a series of diagrams on p. 178. Initially the nacelle is unstable and tumbles, but, after a suitable delay, an M.L. Aviation extractor gun on the left-hand side of the centre section fires a vane-type G.Q. stabilizer parachute from the right-hand side of the decking to stabilize the nacelle's fall and at the same time pulls out the main canopy. The latter is a 36ft G.Q. blank-gore model and it is attached by Terylene-rope suspension cables to two points on the main bulkhead and one anchorage on the rear nozzle-ring. When this canopy is fully developed the rate of descent is stabilized at about 25 ft/sec with the nacelle in the horizontal position.

As the nacelle falls, ram-air enters through fabric non-return valves, thus filling the air bag (which is a single envelope of Terylene canvas). The air-bag box is normally covered by a pair of doors reminiscent of those over a bomb bay, but these are sprung open by bungee cords during the jettison cycle, allowing the bag to distend in a downward direction. When the nacelle hits the ground, the shock is absorbed by the deflation of the bag, and at the same time the main canopy is freed so that the nacelle cannot be dragged by the wind.

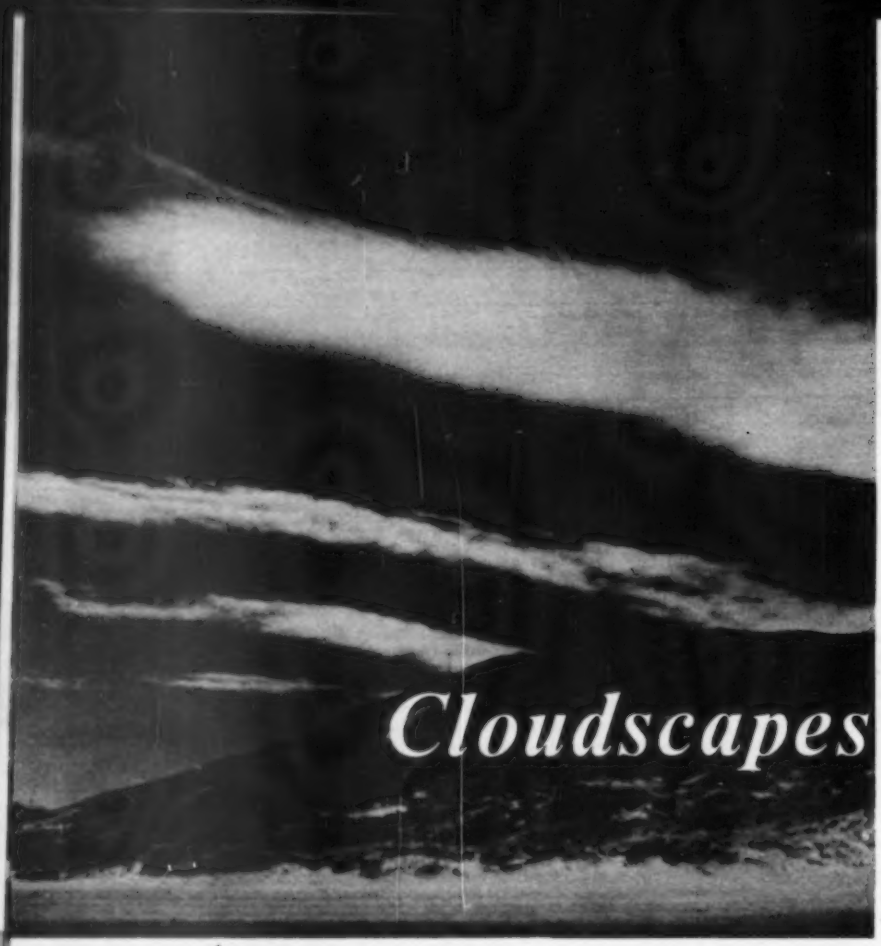
The nacelle is stabilized on the ground by the increased width provided by the open air-bag doors, each of which projects outwards horizontally. The base of the air cushion is of wood, painted with Nutracoat for resistance to H.T.P. Compatibility with H.T.P. is one of the reasons for using Terylene so extensively; this material, impregnated with p.v.c. to increase resistance to abrasion and the weather, is also used to cover the stowed main canopy. Another advantage of Terylene is that its great elasticity absorbs shocks gently.

Altogether the pack is singularly neat and it is now highly developed. In the form in which it now exists the system was first dropped in April last year, the carrier aircraft being a Brigand of the type used in the development of the earlier Super Sprite nacelle. Operating from the A. and A.E.E. at Boscombe Down, the Brigand has proved the release cycles for both the Vulcan and Victor nacelles, and the complete unit will presumably shortly go into production for issue to units operating these aircraft.

RANGE PERFORMANCE OFF THE CUFF

This five-disc slide-rule, produced by General Electric Flight Propulsion Laboratory, Cincinnati, Ohio, solves (from the parameters of initial weight, final weight, Mach number, L/D ratio, s.f.c. and cruise altitude) the Bréguet range equation or any unknown. Another scale solves dynamic pressure and lift coefficient from Mach number, altitude and wing loading. The scales are in three colours, and the calculator is straightforward to use once an accompanying example has been worked through. Accuracy is claimed to be one per cent, but a little care has to be used to see that the scales do not slip. Overall diameter is 6in.

Cloudscapes



1

2

3

LOOKING at clouds has for years satisfied many aspects of human nature. The scientist finds evidence of the behaviour of the air, while the artist sees a changing beauty in design and form. A cloud-strewn sky is a universal backcloth of many moods.

Some of the original beauty of clouds is inevitably lost when they are portrayed in black-and-white photographs. But such pictures remain as striking reminders of the state of the sky at a chosen moment and, if the moment is well chosen, they can be both beautiful and informative.

The photographs on these two pages are taken from two colour filmstrips *Clouds* compiled by F. H. Ludlam and Dr. R. S. Scorer (both of Imperial College) and produced by Diana Wyllie, Ltd., 18 Pont Street, London, S.W.1. These were shown at the Kronfeld Club, London, on Wednesday, January 29.

Wave clouds, orographic in origin, are here illustrated in photographs 1, 2, 3 and 6. Examples of convection clouds are seen in 4 and 5, while 7 portrays one variety of ice cloud.

(1) A train of lee-wave clouds at about 3,000ft, spaced a little less than one mile apart. The wind is blowing from the distance on the left, and the clouds lie across the wind. (*Photograph by R. S. Scorer.*)

(2) The Sierra wave in California, photographed from a sailplane at 20,000ft. Wind is from the right and the mountain range is off the picture to the right. From bottom to top the clouds are the turbulent rotor-cloud, a water-droplet wave cloud, and an ice-crystal wave cloud (also turbulent) crossed by an aircraft condensation trail. (*Betsy Woodward.*)

(3) Stratocumulus waves. The tops are smooth because there is a dry, warm layer above, and the flat bases indicate a uniform condensation level. Cloud caps are formed by the lifting of the drier air above the crests of the highest waves. (*Betsy Woodward.*)

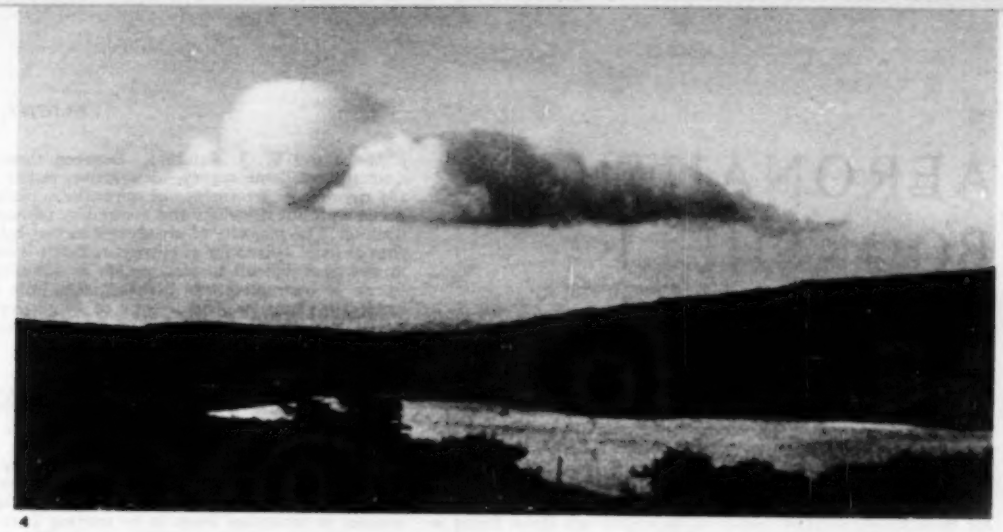
(4) Small, early-morning cumulus over hilly country, forming on the right, growing larger as the wind blows to the left and (in the case of the large cloud on the left) topped by a smooth *pileus* cap. (*R. S. Scorer.*)

(5) Scattered small cloudlets of altocumulus, composed almost entirely of supercooled droplets. These clouds occur in the middle atmosphere at levels where the temperature is between about -10 deg and -20 deg C. (*R. S. Scorer.*)

(6) Solitary wave cloud lying in the wave-crest over a hill. The air enters the smooth right-hand edge, and evaporating cloudlets are seen moving out of the rear. (*R. S. Scorer.*)

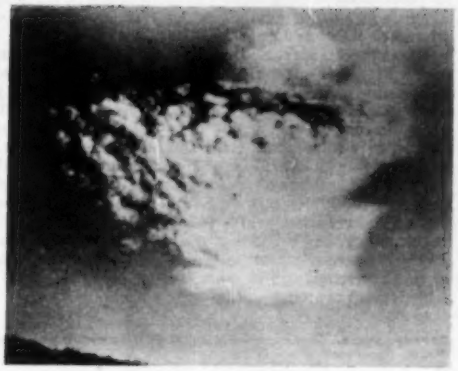
(7) Cirrus fallstreaks. These ice-crystal trails often originate as cirrocumulus whose droplets freeze and then grow as they descend through a layer of air which is supersaturated for ice. To the pilot these clouds are often almost transparent, as the ice crystals are not closely distributed. (*H. Klieforth.*)

Haze, convection clouds and ice clouds are shown in filmstrip A of the pair mentioned above; and layer clouds, wave clouds and billow clouds in filmstrip B. The printed explanatory notes which accompany the strips are by Ludlam and Scorer, authors of the recently published book, *Cloud Study*.



4

5



6

7

AERONAUTICAL BOOKSHELF

Flying Tales from Blackwood. William Blackwood and Sons, Ltd., 45 George Street, Edinburgh 2, and 1 Bateman's Buildings, London W.1. Price 15s.

IN general, aviation literature is not an example of well-written English. Much of the work which finds its way to the bookstalls is dull; it attracts only those who want to know about the subject of a particular book, and only occasionally do we find what our tenets consider a "good book." How pleasant, then, to have these stories from *Blackwoods Magazine*, which is one of those which looks for good, well-told stories and publishes them for these qualities. That many of its articles are about flying is incidental, but this collection of the best of them over the last 50 years make a book which is more likely to be found on almost anyone's fireside shelf than to enjoy the dubious distinction of a limited circulation amongst aviators.

There are 16 stories, varying from an exultant description of a pilot's first dive through Mach 1 to a tale of the real pioneers at Brooklands who, having got their craft to leave the ground, then had to experiment to find out what effect, if at all, their controls, if any, might have. But it is not the gist of the stories which attract; it is their good, clear English. One who has never taken-off in a flying-boat will be able to experience that exhilaration by reading E. C. Palmer's description: "Water thudded against the hull like blows from a cushioned hammer, and the ports were bathed and rebathed with flying spray. The hammering increased in frequency, and merged into a steady drumming underfoot, then abruptly ceased." That is typical of the way each separate story in this collection makes some aspect of flying come alive. What a wonderful change. A. C. B.

Aerodynamics. Butterworths Scientific Publications, 4 and 5 Bell Yard, London W.C.2. Illustrated. Price 7s 6d.

THIS publishing house has, in recent years, produced a number of outstanding and exceedingly erudite works in many fields of interest to aeronautical engineers. The majority of these works are large and expensive, but *Aerodynamics* is a series of papers revised and reprinted from *Research*, the latter being Butterworth's own monthly journal of scientific subjects.

The authors are T. Nonweiler, J. L. Stollery, A. W. Babister, J. Black and W. J. Rainbird. Between them they present an eminently readable survey—descriptive, rather than mathematically rigorous, in treatment—of the entire subject, excellently illustrated with line drawings and assisted by bibliographies of further reading. The majority of aerodynamics text-books are necessarily "out of date"—in so far as current research is concerned—and are in any case difficult to read except as adjuncts to an organized course of instruction. In contrast, this little booklet, which is appreciably smaller than a copy of *Flight*, can give the casual reader a really excellent outline of the entire vast subject without presupposing much prior knowledge. W. T. G.

The Sources of Invention, by John Jewkes, David Sawers and Richard Stillerman. Macmillan and Co., Ltd., St. Martin's Street, London W.C.2. Price 31s 6d.

THE individual inventor is (it seems from this serious discussion by three authors) in danger of disappearing, as a result of the growing art of taxation so skilfully and thoughtlessly practised by governments. The genius who makes a discovery, and a little money from it, is likely to have to pay crippling taxes; and so the sources of invention seem to be moving from the individual to the teams supported by outside interests. Wisely, the authors make no hard predictions about when the race of inventors will die, or even say categorically that it will die. Equally wisely, they point out that predictions about inventions themselves (and presumably inventors, too) have often been inaccurate. In 1906 *The Times* asserted that "all attempts at artificial aviation . . . are not only dangerous to human life but foredoomed to failure from the engineering point of view." The book provides a well-documented background to inventions and inventors and the relative chances of survival of the amateurs and the professionals. A. C. B.

The Geography of Air Transport, by Kenneth R. Sealy M.Sc. (Econ), Ph.D. Hutchinson University Library, 178-202 Great Portland Street, London W.1. Price 10s 6d.

THIS is a straightforward textbook for systematic study by the student of air transport. A deep and detailed discussion of how, why, where and when goods and passengers take to the air, it covers the growth and organization of air transport on a world-wide basis. Because of the availability of suitable material, and the status of the industry in Britain and the U.S.A., a good proportion of the book is concerned with British and American practice. This is sensible, for many of the newer airlines have learned much from the hard experience of both these countries.

Those critics who say that airlines are over-expensive national luxuries will, if they trouble to look for it, find here a wealth of detailed information to convince them that airlines must, by their very nature, face operating and maintenance charges on a far higher scale than any other method of transport. J. W. B.

ERNST HEINKEL

A WEEK after his 70th birthday, Dr. Ernst Heinkel, one of Germany's greatest aircraft designers and constructors, died in a Stuttgart hospital on January 30. News of his death came almost simultaneously with reports of closer identification of his business with that of Willy Messerschmitt (the two were already co-operating as members of the Union-Flugzeugbau Sued group, which is building Fouga Magisters under licence).

Ernst Heinkel—a tinker's son—built his first aircraft while still a student at Stuttgart Technical College in 1910, and was severely injured in an accident whilst attempting to fly it a year later. Three years afterwards he was appointed technical director of the Hansa und Brandenburgische Flugzeugwerke, and during World War I he designed some 30 types of aircraft.

After the war he founded his own company and began the design and construction of a long and successful line of aeroplanes. Among his more notable products during the inter-war years was the He 112U fighter in which Ernst Udet achieved 394.6 m.p.h. in June 1938; and a variant which, flown by Dieterle, took the world air speed record at 463.9 m.p.h. in April of the following year. (A few weeks later this record passed to a Messerschmitt Me 109R, which achieved 469 m.p.h.)

At this period Heinkel was exploring the possibilities of accelerated take-off for fighters, with catapults and rockets, and in August 1939—according to an interview which he gave in 1951—he flew a jet aircraft, the He 178, without the knowledge of the *Reichluftfahrtministerium*. (The Gloster-Whittle E.28/39 first flew in May 1941.)

Best-known of his bombers were the He 111 and He 177, both standard types in World War II. Also noteworthy were the He 280 twin-jet and He 162 single-jet fighters and the He 219 twin-engined night fighter.

After the war Ernst Heinkel was fined by a denazification court, but on a subsequent appeal was cleared of the accusation of being a "Nazi follower." In 1950 he re-entered industry as a manufacturer of lightweight road vehicles.

ANOTHER PIONEER PASSES

ONE of Britain's pioneer pilots, Lord Egerton of Tatton, has died in Kenya at the age of 83. As the Hon. Maurice Egerton, and one of the select band of the original Eastchurch pilots, he took his aviator's certificate in 1910, and in that year was awarded an Aero Club prize of £50 for a circular flight of one mile in his British-built Wright biplane; soon afterwards he was rivalling J. T. C. Moore-Brabazon (now Lord Brabazon of Tara) in flights of ten miles or more.

After the First World War, in which he served in the R.N.V.R., he turned from flying to such other adventurous pursuits as big-game hunting and was subsequently engaged on large-scale agricultural development in East Africa.

WHEELED OTTERS IN ANTARCTIC

TWO de Havilland Canada Otters of the U.S. Navy made the first wheeled landing on the Antarctic Continent on February 1, alighting on a rough 1,100 yd strip which had been bulldozed from marble and granite at Marble Point. The first aircraft, piloted by Cdr. W. J. Coley and carrying Sir Edmund Hillary, Admiral G. Dufek and Captain P. Maher, U.S. Navy Commander in the Antarctic, made an uneventful landing, but the second aircraft broke its tail-wheel and swung across the strip, damaging the surface. It took off later with an improvised tail-skid. Marble Point is a possible site for an international all-weather airport, which it is estimated would cost £100m and take six years to construct.

proof against vibration or flexing in high ambient temperatures

There is an increasing need for flexible pipes capable of working in positions where they are subjected to vibration or flexing in high ambient temperatures.

Effective in temperatures minus 55° to 400°C.
Dunlop "Fleximet" pipes are all-metal assemblies developed to work in a temperature range of minus 55° to 400°C in aircraft fuel, oil and oxidant systems.

Designed for high and medium pressure ranges
They are manufactured in two types. The high pressure assemblies are extremely flexible, and are designed to work at pressures up to 6000 p.s.i. with low fluid flow. The medium range working pressures vary according to bore diameter and are capable of handling relatively high fluid flows.

Details on application
These all-metal pipes are a valuable addition to the range of conventional flexible pipes employing rubber hose already available. Further details of "Fleximet" pipes can be obtained from:—

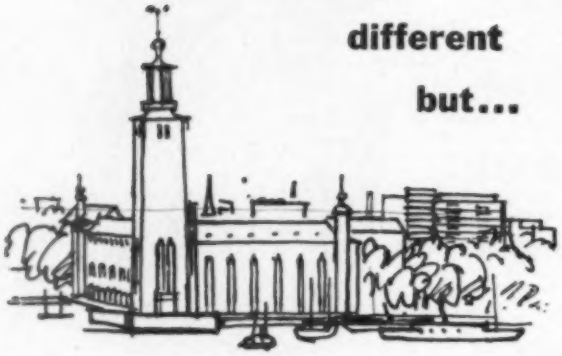
DUNLOP RUBBER CO. LTD., AVIATION DIVISION, ST. GEORGE'S ROAD, COVENTRY

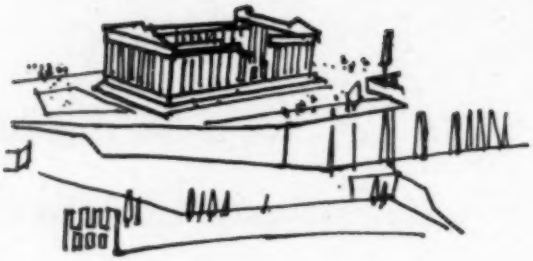
DUNLOP 'FLEXIMET'
ALL-METAL FLEXIBLE PIPES FOR AIRCRAFT SYSTEMS

—another Dunlop service to aviation!

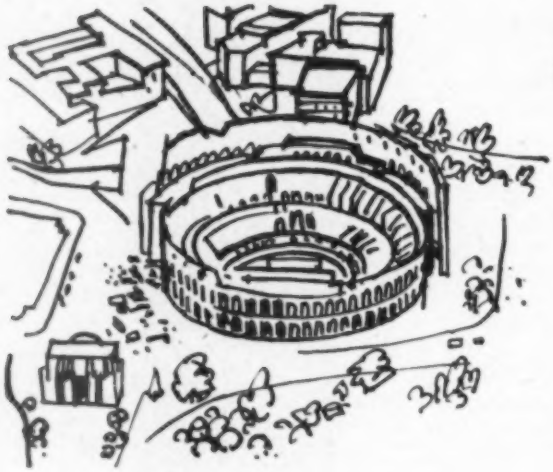
6H/625

The landmarks may be different but...





the service is the same



As air travel reaches out to all the countries of the world, so must the services which keep the aircraft flying. The BP Aviation Service is international; at hundreds of different airfields it supplies the essential fuelling and other services on which modern air travel depends.

AVIATION BP SERVICE

serves aviation well

The international aircraft fuelling organisation of
The British Petroleum Company Limited

Straight and Level

I LIKED Mr. Kruschev's remark last week to Sir Patrick Reilly, the British Ambassador in Moscow: "You see how easy it is for me, a former coal-miner, to argue with you, a trained diplomat." His point, I imagine, was that arguments can only be as strong as the policy which backs them.

But whether a trained diplomat has a policy or not, he is hard to outwit. I have just made an admiring study of the way Ministers deal with loaded questions about British aviation. A glittering, tinselly wrapping of good humour and courtesy conceals the doubletalk, something along the following lines:

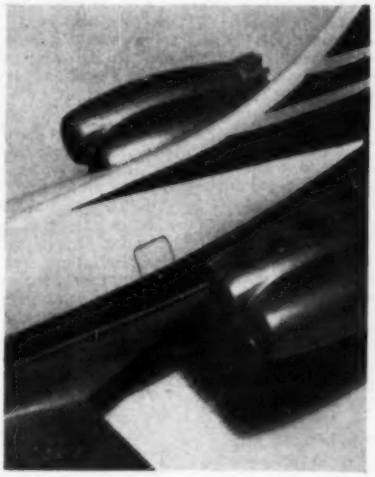
The Minister of Planes, the Rt. Hon. Mr. Jeremy Squelch: "I am very glad the hon. Member asked that question. It is a very good question, full of important and valuable points. But perhaps he did not hear me—obviously I did not make myself clear, which was stupid of me, and for that I apologise—when I said that I will always welcome suggestions from any quarter—I repeat, any quarter—which will help to resolve this problem. I want to be perfectly frank about this . . ."

● But let me give credit to Ministerial utterances which are forthright and to the point. The Minister of Transport, Mr. Harold Watkinson, referred in the House last week to B.O.A.C.'s cost per ton-mile. Now this is a matter to which the Corporation is particularly attentive, because it is a measure of efficiency. One would therefore expect the Minister to be tolerantly circumspect when referring to it—at least in public. But, in fact, he described B.O.A.C.'s costs, which now stand at 39.9d per c.t.m., as "very high"—which are strong words for B.O.A.C.'s boss to use.

● Many a sly chuckle must have rippled through Italy's erstwhile Communist aircraft industry the other week when *Ali Nuove* burgeoned forth with a handsome special issue dedicated to the United States Air Force. Emblazoned in full colour on the front cover were the insignia of the mighty U.S.A.F. over the 48 years of its existence. The emblem for the period 1910-1916 was a plain, five-pointed star—in the rosiest of reds.

● Airline men—especially aircrew—often discuss the names given to airliners. In B.E.A., for example, there is a lot of feeling that the present fleet-names are a tremendous improvement over the ghastly *Verdant, Vassal*, etc., which defaced the old Vikings. But what about B.O.A.C.? Even the present names cannot be termed inspiring, and there don't seem to be any at all for the Britannias or Seven Seas. For my money the best of the lot are PanAm's: there's something about *Clipper Bald Eagle* (for example) which looks really well on a modern airliner. It must be worth something in traffic, too; certainly the mere name Clipper gets PanAm masses of free publicity.

● There is no doubt that the VC.10's rear-mounted powerplant will attract passengers—especially any who happen to use the back door while the Conways are turning up more than 2,500 revs or



so. But no panic. A similar problem arose on the Viscount: Capital Airlines found that they could not disgorge passengers from the front door until the port Darts had stopped spinning. British Messier and Dunlop stepped in with a neat idea—a propeller brake linked with the operation of the airsteps.

● The trouble with highly swept aircraft is that they land at an impossible nose-up angle. One very fast British aeroplane could do with a deep trench along the centre of the downwind-end of the runway to take the tail; meanwhile, it just lands faster than it needs to. There are two ways out: either you can have a hinged tail—like the F.D.2 but at the other end, and hinging upwards—or you can be like Chance Vought and have a variable-incidence wing. Their Crusader is brilliant; look at its stubby undercarriage, made possible by the fact that it lands with the fuselage level.

● Thought in passing: Is the F8U Crusader an aeroplane? There must be a pedant somewhere prepared to argue that, because it has variable incidence, it does not have a fixed wing.

Which reminds me, isn't it about time someone made his mind up about angles of "incidence" and "attack?" Almost everyone these days talks about angles of incidence when they really mean the other thing; or am I getting pedantic myself?

● One of my pet aversions is having two names for the same thing—like "tailplane" and "stabilizer," for example. We really must find some way of rationalizing aviation terminology; and, even more important, we must make quite, quite certain that no new term is brought into common use unless it has been agreed among all English-speaking peoples.

Even the recent field of missiles—sorry, I mean guided weapons—is giving rise to all manner of unnecessary complications. In America an anti-aircraft guided device is a surface-to-air missile—a self-explanatory term which fits in with air-to-air, air-to-surface and surface-to-surface systems. In Britain we are unaware of anything called "surface"; it is the ground. Hence "ground-to-air weapon" (not missile). As for a British air-to-surface missile, that unhappy device relishes in the incredible designation of "stand-off bomb." This is quite self-explanatory; it must be an ordinary bomb which somehow "stands-off" from its target. Or could it mean something utterly unlike a bomb which doesn't stand-off, but whose carrier vehicle does? The trouble is, once a term has become accepted we use it every day without realizing how crazy and ambiguous it may be.

● American firms are pretty shrewd, but the atmosphere surrounding some very prosperous outfits over there seems (to put it mildly) a little unreal. Literally billions of good dollars are being spent on "system-concept-evaluation," "design-efficiency-investigation," "cybernetics," and heaven knows what else. It all involves thousands of highly qualified chaps getting into a huddle and coming up with an idea rather than a product.

I'm for the good old days. Remember how Andy Willgoos and George Mead sat down in a garage and designed the Wasp—first Pratt and Whitney engine? They did it for a total cost which today would perhaps buy the blading for one compressor stage on a J57. You can't beat the good, old-fashioned mechanical engineer, whatever the Ph.D.s get up to.

● Mr. Farey Jones, M.P., said in the civil aviation debate last week: "We already know that helicopter services can be made to pay."

I am sure that the hon. Member for Watford, whose enthusiasm for helicopter services I share, intended there to be no *double entendre* when he made this remark.

ROGER BACON

Members of the Armstrong Siddeley Flying Club seem pleased with life as they effectively obscure the view of Tipsy G-AFSC at Baginton. Harold Ashworth, the club's chief flying instructor, is third from right, second row.

CLUB AND GLIDING NEWS

DEVELOPMENTS in glider design were reviewed by Mr. K. G. Wilkinson at a meeting of graduates and students of the Royal Aeronautical Society on Tuesday, January 28. Starting with comments on the laminar-flow wing sections which had become available since the war, he went on to describe some aspects of the more sophisticated sailplanes which had competed at St. Yan in the 1956 world championships. The talk was illustrated with detail photographs of some of these machines, which included the Yugoslav Meteor, the Czechoslovak Blanik, the Swiss Elfe, the German HKS 1, HKS 3 and Zugvogel, and the Italian Eolo. Also shown were pictures of a novel Italian sailplane designed by the Morelli brothers. This incorporated a T-tail, a semi-prone pilot's position (with the pilot leaning back, not forward), and a control system having no rudder pedals (rudder movement being achieved by control-wheel rotation about a vertical axis).

MEMBERS of No. 600 (City of London) Sqn., R.Aux.A.F., which was disbanded last year, are now well on the way to forming a flying group. They already have a Tiger Moth and a Rapide based at Biggin Hill and plan to start flying in the near future. Many of the ground personnel of the squadron have joined and will receive flying instruction from the pilots, some of whom are qualified instructors. The Popular Flying Association is giving advice and the group will eventually become affiliated to the Association. Plans are in hand for the group to take part in one or more of the continental rallies this year and, possibly, to fly the Tiger Moth in the National Air Races.

MODIFICATIONS to Hawk Trainer G-AITN by the Experimental Flying Group at Croydon have resulted in improved performance and general handling, C.F.I. Rex Nicholls reports. These have concerned fuel tanks, cowlings, and flaps, and are described by Mr. Nicholls as follows:—

Whenever the Hawk Trainer wings were removed for servicing it seemed obvious that the centre-section fuel tanks occupied only about 60 per cent of the available space. This indicated the possibility of an increased fuel capacity and a consequently increased range. The standard oil-tank capacity of two gallons would limit the extra fuel that could be used, but we considered that an extra 3½ gallons of petrol in each tank would not risk running the oil low. The standard fuel tanks were removed and a 5½-inch section inserted, increasing the capacity from 10.5 to 14.3 gallons. The maximum endurance has now increased from three to four hours.

The original cowlings over the Gipsy Major engine consisted of removable top and side panels, each requiring a screwdriver to operate the fasteners. The oil tank was reached by removing one of the side cowlings: this was invariably dropped on the ground and damaged and, in addition, fatigue cracks were frequently experienced. We therefore decided that a layout similar to that of the Chipmunk would be preferable. The new cowlings have now been fitted: their appearance is much neater and opening and closing can be easily accomplished by hand.

The flaps of the standard Hawk Trainer consist of five panels, three of which are attached to the centre-section. When extended, these flaps are extremely effective but unfortunately have an adverse effect on the climb when overshooting. The flaps-down climb has in fact averaged only 200ft/min, and this leaves little height to spare over the trees and houses surrounding Croydon Airport. To improve the rate of climb we decreased the flap area by disconnecting the outer panels and fixing them in the "up" position. This reduced the flap area by nearly 50 per cent and the flaps-down rate of climb is now 350ft/min.

Flight tests disclosed a nose-up trim-change on extending the flaps—compared with the previously familiar and somewhat violent nose-down change of trim. This nose-up change is easily corrected with the stick and trimmer.

As much work as possible on these modifications was carried out by members of the Group. The original schemes were planned by Peter Elliott, the Group engineer; cowlings were made by Roy Greenwood; and working drawings were prepared by Bob Cleary.

LATEST product of Slingsby Sailplanes, Ltd., is the T.45 Swallow single-seater, the prototype of which is at present being test-flown at Lasham by the B.G.A. No. 1 Test Group. The following notes on the new sailplane, several of which are already on order, are supplied by the designer, Mr. F. N. Slingsby.

The Type 45 is a small, low-priced sailplane (£700 without instruments) which should appeal both to private owners and, although not primarily a training type, to clubs. It has light controls, good handling qualities and a comfortable cockpit and, while performance is necessarily limited by the size of the machine, it has a laminar-flow wing which brings it into the class of many current high-performance types. The Swallow's high degree of manœuvrability and small circling radius should, in weak thermals, go a long way towards eliminating the difference between it and the larger machines. Unlimited cloud flying is made possible by the terminal-velocity dive-brakes, and the trimmer contributes towards comfort on aero-tows and long flights.

Construction of the Swallow is a compromise between the standards required for aerodynamic efficiency and the requirements of a simple, robust structure. The wing has laminar-flow performance. The fuselage nose has the familiar lines of the Skylark series, and these fair back into a fabric-covered rear fuselage of rectangular section. The fuselage is of simple construction and is straightforward to maintain and repair. Tail units are Skylark 2 components with slight adaptations. Wing-fuselage attachment is by coaxial fittings on main and front spars, three pins attaching the main spar and two the nose spars, and the wingtips can be rested on the ground during rigging. The undercarriage consists of a normal main skid and wheel as fitted to the Skylark 3, with a spring-leaf tailskid.

Gold C flights, in Mr. Slingsby's opinion, should be well within the Swallow's capability, in spite of its simple, rugged construction. It is intended to make available kits of parts for amateur construction of the machine.

Basic data include: span, 39ft 4½in (12m); length, 23ft 8in; estimated performance at 620 lb gross weight, maximum gliding angle, 1 in 24 at 45 kt, minimum sink, 3ft/sec at 40 kt.

UNIVERSAL ROTARY ACTUATORS

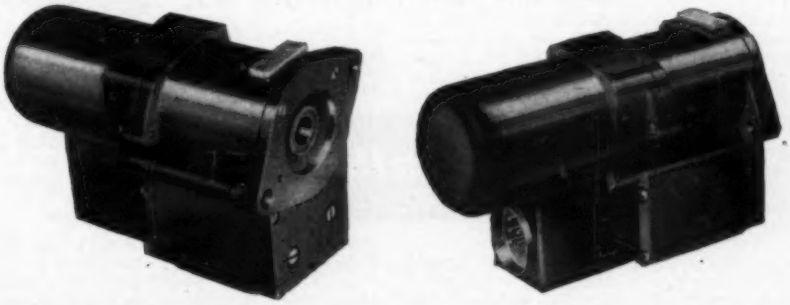
We are now in production with a Universal Rotary Actuator which greatly simplifies the work of the aircraft designer, constructor and operator.

With this design, one basic Actuator can do a wide variety of jobs—and can easily be adjusted by the customer to suit specific applications.

One and the same Actuator can be adjusted either for total rotation in either direction, or for a total angle of rotation of 180°, with a mid-stopping position, or for an angle of rotation of any lesser total than 180° (in steps of 5°) while still retaining the mid-stopping position.

The ENGLISH ELECTRIC Universal Rotary Actuator operates on D.C. of 18 to 29 volts, has a normal loading of 50 lb. ins., and embodies a high overload capacity over a temperature range of —55°C to +150°C.

Very early delivery of these actuators can be made to meet orders. Full details and dimensions, and advice on their use, will be sent to you on request.



THE **ENGLISH ELECTRIC** AIRCRAFT EQUIPMENT DIVISION · PHOENIX WORKS, BRADFORD 3

A834

'ENGLISH ELECTRIC'
aircraft equipment

Successful heat exchange and heat insulation

We design, manufacture and supply heat exchangers for many purposes in both aluminium alloy and stainless steel. This particular example is for the Vickers Viscount's anti-icing system. Similar units are supplied for the Fokker Friendship and the Bristol Britannia.

This thermal blanket is in refractory fibre cased in .004 inch (.1016 mm) stainless steel. It was made-to-measure and is extremely light, the dimpled construction being responsible for its great strength. Specified for Rolls-Royce and Armstrong Siddeley jet and turbo-prop engines. Approved by the A.R.B.

High pressure fuel-cooled oil cooler for high performance gas turbine engines. This unit is used in the Armstrong Siddeley Sapphire S.A.7

Delaney Gallay LTD

Vulcan Works, Edgware Rd., London, N.W.2 GLAdstone 2201

Success in our business doesn't merely mean the ability to manufacture, though we are extremely well equipped, even to the extent of having our own aluminium flux bath brazing plant.

Success, to us, means the ability to solve problems; to produce something that will do a new job, or perhaps an old job in never-before-experienced circumstances. And then, of course, to make it a practical and economical proposition.

We have enormous experience and wide resources. If we can help you in any way with heat control equipment, please contact us. We are always at your service.

We are now introducing Sealed Blankets for Civil Aircraft

CORRESPONDENCE

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. The names and addresses of the writers, not for publication in detail, must in all cases accompany letters.

Restrictions on the Private Pilot

IT is very disheartening to see the light-aeroplane movement attacked so selfishly by big commercial interests, particularly its near relatives the airline pilots and commercial flying schools.

An awful lot of nonsense and half-truths have been written by thinly disguised individuals who should know better. The airline pilot from Jersey and the spokesman from Hamble both make the point that Club C.F.I.s have no Commercial Licences. In fact, the M.T.C.A. insist that any club giving the 30-hour approved course and holding an A.T.C. contract has a C.F.I. with a Commercial Licence. Further, the R.A.F. (in the form of Home Command) visit the clubs at least once a year and test all instructors used for A.T.C. training, not only in a detailed flying test but in a thorough ground examination. All aspects of flying, and air traffic procedures, are included. All established clubs hold these contracts and most of their instructors have R.A.F. approval. As for Commercial Licence training, a bit of statistical research would probably show that 90 per cent of British boys who have fought their way through to a Commercial Licence without Service training since the war, have done it through the clubs, and it is only now, when the various subsidy schemes are being put forward, that commercial schools are showing interest.

The business of the sterilization of vast amounts of air space for the airlines is the end-product of a Ministry and air traffic control system armed with police powers, and descended from the squadron dogsbody condemned to be permanent duty pi'ot during the war because he was too useless to do anything else. It is the attitude of this type, now given these police powers (which by his very nature he is unfitted to use) that the average pilot objects to, and which causes most of the difficulties. There are few troubles with the good and competent ones; the dud (and there are many of them) is far too busy asserting his war-deflated ego to get on with his job of helping those who want to or have to fly.

There is no reason whatsoever for at least 50 per cent of the sterile sky; probably with really good controllers it would be nearer 90 per cent. The airlines fly at known heights and on known tracks; there is no reason why these heights should be less than 5,000ft. No light aeroplane wants to be at that height in I.M.C. unless it is properly equipped, and certainly no airline should be navigating along the railway line where the non-radio aircraft probably are. All approaches in I.M.C. are monitored by various radio devices, so the commercial aircraft's approach track is fixed and his position known. It only requires our very expensive air-traffic controllers to sterilize these narrow areas, leaving free approach-paths for non-radio aircraft (and in fact, to control traffic by using all their available facilities, instead of showing their incompetence by stopping it) for us all to fly happily and safely.

Whatever the outcome, let us stop this sorry business of pilot snipping at pilot, and use all our efforts and those of our organizations to reform that entirely disastrous organization, the Ministry of Transport and Civil Aviation, and replace it with an entirely new set-up, willing and able to encourage all aviation, and prepared to work out a system under which we can all fly, and be encouraged to do so.

Southampton Airport. V. H. BELLAMY,
C.F.I., Hampshire Aeroplane Club.

A LONDON evening paper reports that after an inquiry with reference to noise, "The Housing Minister is allowing Mr. Robert Jones to continue the use of his private airstrip in the grounds of his home, Stilemans, Munstead Heath, near Godalming, as a take-off and landing ground for his light aircraft."

It is certainly very refreshing to see one of Her Majesty's Ministers supporting private flying—even if it is not the one whose bounden duty it is to do so.

Croydon Airport, Surrey. C. NEPEAN BISHOP.

The B.A.O.P.A.

AT the risk of boring your readers, may I reply to Mr. Tudor's letter (January 17) through your columns, to put him at his ease about my "curiously silent" Association. . . .

Our proposals are envisaged to see a change of policy giving the private flier (who incidentally forms the biggest single group of aviators, barring the R.A.F.) a fair share of British skies. We have formed a syndicate of members who take an equal percentage of all unjust fines (and costs) levied by the M.T.C.A. on members. We intend to take legal action, if necessary, against the Minister or his servants where he, or they, contribute (through negligence of accepted aviation practice) to an accident or to the hazarding of an aircraft or its occupants. Also to take action against the Minister where, in alleging a breach of the Air Navigation Act, the Minister slanders or brings frivolous accusations against a member, thereby implying the member is wanting in skill and judgment. In short, all those things that the Ministry have delighted in in the past will be contested.

East Grinstead, Sussex. M. J. CONRY,
British Aeroplane Owners and Pilots Association.

[Among other information supplied by Mr. Conry in answer to a request by *Flight* are the facts that the British Aeroplane Owners and Pilots Association was formed in September 1957; its present membership is twelve; its affairs are administered by a three-man committee which includes Mr. Conry as hon. secretary; it has no entrance fee and no annual subscription; and it is not associated with the Aircraft Owners and Pilots Association (of the U.S.A.), the Royal Aero Club of the United Kingdom, or any other body.—Ed.]

Capital's Troubles

THE comments in your issue of January 10 on the difficulties encountered by Capital Airlines were most interesting and informative. It is particularly unfortunate that Capital, the first U.S. carrier since the war to choose British equipment, should run into such serious financial difficulties, for its competitors will lose no opportunity to blame the aircraft rather than the operator.

My own opinion is that Capital made a grave error of judgment in fitting only 40 seats to their Viscounts, compared with 47 for B.E.A. and most other operators. Consequently Capital's Viscounts have been operating "on paper" at extremely high load-factors but have not been earning their potential maximum revenue. It was reported in April 1957 that they were achieving a 63 per cent passenger load-factor with a "break-even" of 55 per cent. If the seating density had been higher, the break-even load-factor would have been reduced.

Also, since the standard of comfort in U.S. domestic operations for "standard" class is generally the same as international "tourist" class, Capital were in fact offering a first-class standard of seating at a tourist fare which, while placing them in a strong position competitively, did not pay dividends.

Capital will not be the only carrier to face serious difficulties when it comes to the disposal of outdated piston-engined equipment. That is one more of those problems arising from the so-called jet age.

Brussels. PROFIT AND LOSS.

Thrust at Roger Bacon

MY thanks to Roger Bacon ["Straight and Level," *Flight*, January 17] for calling me a "noted American journalist" even while thrusting with the rapier (*Flight* never bludgeons, only thrusts). But let me strike back. The point is that we may not be able to say with certainty that an airplane looks right or wrong, but we surely can get an impression that it does.

For example, the Hawker Hunter was probably the loveliest airplane ever designed. If ever an airplane looked "right," it was the Hunter. But it has grown ugly leading-edge extensions, an air brake and blisters simply because it wasn't right.

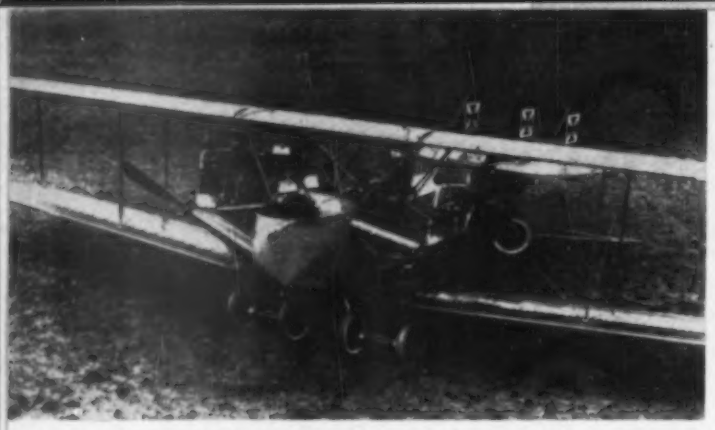
Certainly the tail volume on the SR.177 is greater than that of the SR.53. The major reason is that the later craft is intended to go higher and faster than the prototypes and therefore needs more tail. If the SR.53 gets into a high supersonic flight regime at altitude, then it will jolly well need more tail and I'll bet you dinner at the Mirabelle or other high-class location that it will.

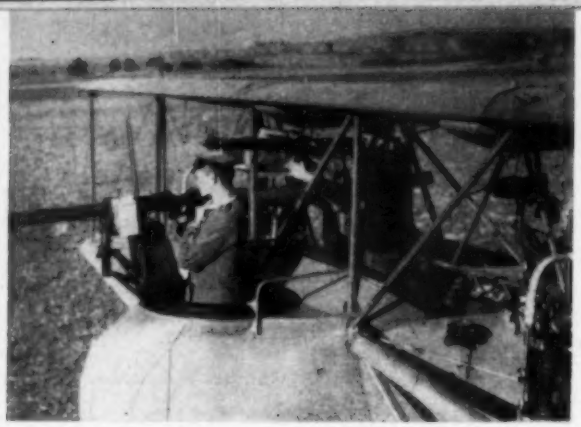
Right now the unhappiest thing I am of (to borrow an English construction that never occurred to *Flight*) is that I have not had the time to grind out my old *Aviation Week* column. I'm delighted that *Flight* has seen fit to inaugurate Roger Bacon's weekly piece.

The major reason for not choosing an asymmetrical layout for the powerplants of the three-engined short-range jet ["Straight and Level," January 24] is quite easy to explain. Most engineers I have known never draw both sides of the centerline, but simply note on the drawing "Left-hand shown; right-hand opposite." Or when they draw the plan view in a G.A. drawing, they frequently draw only half of the plan. If you have an asymmetrical airplane, there are countless numbers of man-hours going to be spent on drawing both sides, or on non-duplicated parts. Engineers have enough to do without having to draw all those extra lines. I'm afraid that R.B.'s idea never will meet popular acceptance in the drawing office.

His scheme for eliminating brochuremanship (S. and L., January 24) delighted me; I wish I had thought of that. Actually it's a practical idea and therefore will never be done.

Geneva. DAVID A. ANDERTON.





The photographs of the A.E.G. GI referred to by F/L. Frank Yeoman. On the left the biplane is seen with all four positions occupied, and the close-up view shows the two forward gun mountings (note the obstructions surrounding the central position).

CORRESPONDENCE . . .

German World War I Rarities

MAY I offer the following information in reply to Mr. Austin's letter of January 17? The unusual German aircraft referred to in *Pilot's Summer* as being "a small twin-engined three-seater with three rudders and machine guns on swivels" sounds very much like the A.E.G. GI. This aircraft meets all the specifications with one exception. It was a four-seater, but had only three positions, which may account for the discrepancy. In the nose was a gunner's cockpit, and behind this was a side-by-side cockpit containing the pilot on the left and a second gunner beside him. The third gunner was located aft of this and to improve his field of fire a large section of the upper wing trailing edge was cut away.

The machine guns were mounted on tubular pylons with provision for height adjustment. The layout generally looks rather unsatisfactory, being cramped, and the centre gun position is obstructed by numerous struts and the upper mainplane, not to mention the broad Teutonic shoulders of the nose-gunner.

I enclose two photographs of the aircraft, this example being G.26/16.

The twin-boom aircraft mentioned in *Thrilling Flights* sounds like an Ago C—again with one exception, in this case the tractor screws. The twin booms of this type extended some distance ahead of the wings, and in the heat of a dog-fight might have been credited with possessing engines. Perhaps another reader can add to this or suggest another type unknown to me which fits the description more accurately.

FRANK YEOMAN.

West Hartlepool, Durham.

[A letter from a reader in Germany—with photographs which we hope to publish later—confirms these identifications—Ed.]

Fraternal Invitation

WE sheep and goats of the aeronautical fraternity seem to be having a pretty thin time: Sir Roy Fedden castigating noted British aviation institutions for being little concerned with the *future* of the industry; and "Beltane" (Correspondence, January 24) champing at the bit because no one seems to care about the glorious *past*—in terms of historical accuracy.

In the first place I am always somewhat chary of correspondents who indulge in coy disguises. Our critical "Beltane" knows all about the Brookses and the Bruces, but what do we know about this champion for yet another aviation society? In the second place it does appear a little presumptuous of the unsatisfied "Beltane" to suggest that there is a need for a new aeronautical history society.

Surely the Royal Aeronautical Society is vastly interested in preserving the historical fabric of aeronautical endeavour? And my own association, Air-Britain, with over 1,000 members (and shortly to celebrate its tenth birthday) is hardly a disinterested organization!

Until such time as "Beltane" may prove otherwise, we must accept his archivist ideals with goodwill and understanding. However, perhaps he would care to shed his mantle of anonymity, roll up his sleeves and do some real practical spadework. There's room at the top for you, Mr. "Beltane," in Air-Britain. Come and join the Bruces and the Jacksons and, I can assure you, there'll be no time to even think of a cup of coffee.

London, W.3. CHARLES W. CAIN,
Founder and Vice-President, Air-Britain.

[Since Mr. Cain's letter was received we have published (January 31) a long letter on this subject from Mr. J. M. Bruce, together with a leading article—Ed.]

Beirut's Terminal Building

A QUICK reply to Mr. Max Karant's comment in your January 24 issue. Your correspondent mustn't believe everything he reads—even if it is in *Flight*.

The description of the photograph of Beirut International should have read, I think, "fine new building." In fact there is only one terminal building, all of which is not yet in use. The extensions are internal, with the intention of bringing the whole building into use and consequently improving traffic handling arrangements.

London, W.14. PATRICIA STROUD.

Joke Over

ON pages 963-4 of *Flight* for December 20, 1957, H. Tempest put forward suggestions for airport designs which your sub-heading described as ". . . of breathtaking simplicity." I have looked forward with eagerness to subsequent issues for comment upon these revolutionary ideas (if only from a taxpayer's point of view) but to no avail. J. W. SIMPSON.

Croxley Green, Herts.

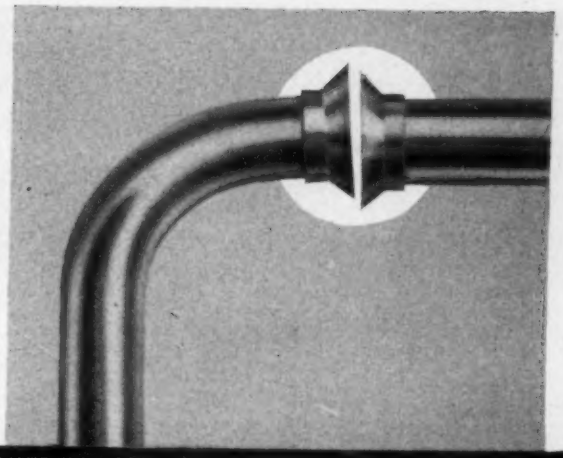
[The "breathtaking simplicity" in our sub-heading was intended to suggest that the article—which appeared in the Christmas number—was not meant to be taken seriously. Nevertheless, a surprising number of people, including the Editor of an overseas newspaper, seem to have done so—Ed.]

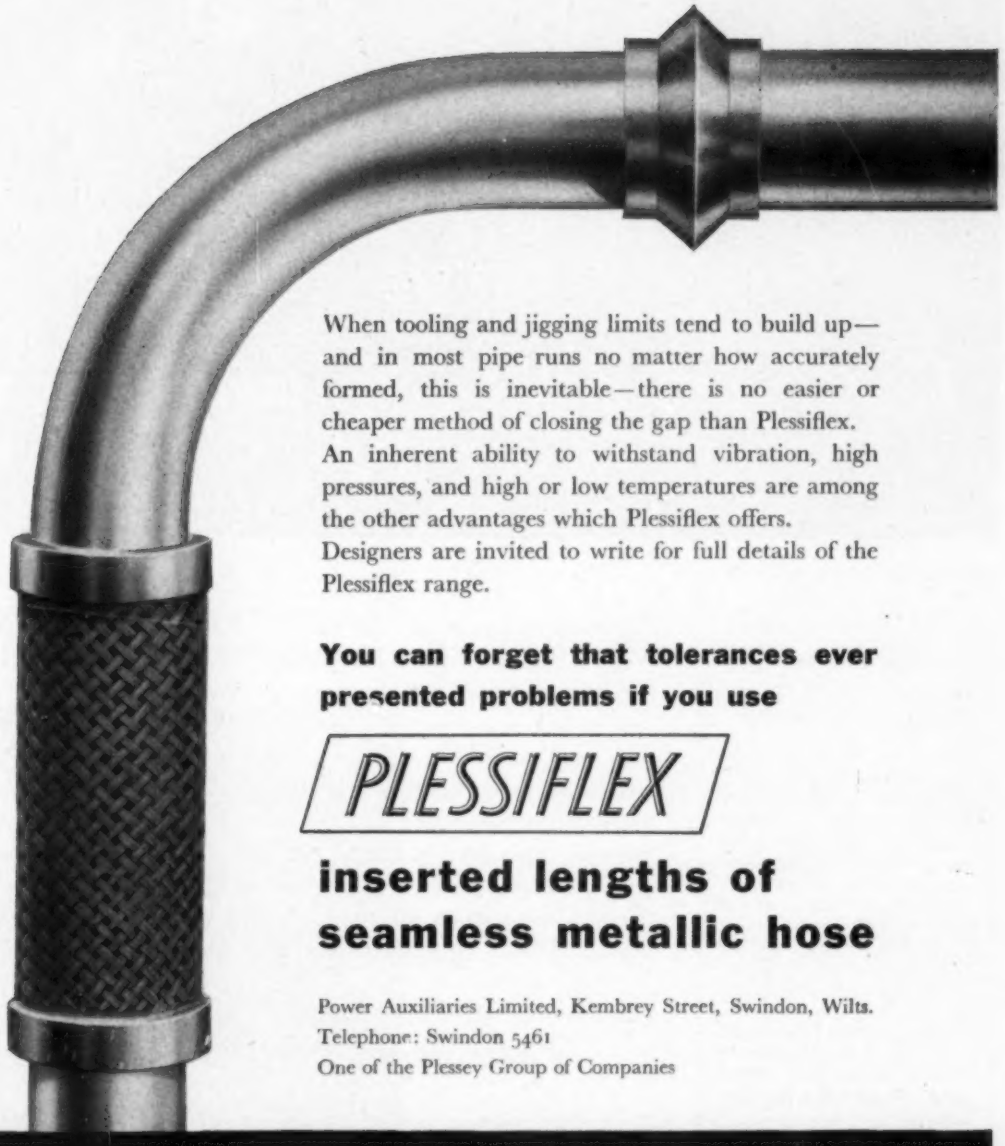
FORTHCOMING EVENTS

Feb. 7. Helicopter Association: "Wind Tunnel Testing of Helicopter Models," by M. S. Hooper.
Feb. 7. A.B.A.C.: Annual Dinner.
Feb. 10. Institute of Transport: Brancker Memorial Lecture: "Control of Air Traffic—Origin, Development and Future Requirements," by A. Cdre. W. E. G. Mann.
Feb. 12. Radar Association: "Early Days of Radar," by Sir Robert Watson Watt.
Feb. 12. Kronfeld Club: "Flying and Motor Racing," by R. Flockhart.
Feb. 13. R.Ae.S.: Main Lecture: "Application of the Theory of Stability in Structural Design," by H. L. Cox.
Feb. 13. R.Ae.C.: Film Show.
Feb. 14. Plymouth Aero Club: Dinner Dance.
Feb. 18. R.Ae.S.: Section Lecture: "Aeroelastic Problems Associated with High Speeds and High Temperature," by E. G. Broadbent.
Feb. 19. Royal Meteorological Society: Discussion: "Meteorological Aspects of Rockets and Satellites."
Feb. 19. Kronfeld Club: "North Wales, The Soaring Pilot's Paradise," by W. Crease.
Feb. 19. Royal Society of Arts: "Rocket Propulsion," by J. E. P. Dunning, M.A., F.R.Ae.S.
Feb. 20. R.Ae.S.: Main Lecture, at Halton: First Trenchard Memorial Lecture, by Air Chief Marshal Sir Dermot Boyle.
Feb. 25. R.Ae.S.: Guided Flight Section: "Guided Flight Trials," by R. W. Boswell.
Feb. 26. R.Ae.S.: Presidential Address by Sir George Edwards.
Feb. 27. Aerodrome Owners Association: Annual General Meeting.

R.Ae.S. Branch Lectures (to Feb. 27):—
Feb. 11. *Boscombe Down*, Film Show. Feb. 12. *Chester*, "Aircraft Fuelling Problems," by E. L. Bass. Feb. 13. *Bristol*, "Production of Civil Aircraft," by Mr. Imlach; *Cheltenham*, "The Microscope in Engineering," by A. E. Bingham. Feb. 17, *Henlow*, Junior Members Lecture Competition. Feb. 19. *Christchurch*, "Aircraft Carriers," by A. J. Simms; *Leicester*, "Activities of the Production Engineering Assoc.," by R. Tilsley; *Southampton*, Branch Prize Papers. Feb. 20. *Bristol*, "Sale of Civil Aircraft," by R. White-Smith; *Halton*, Main Lecture (see above); *Isle of Wight*, "Modern Methods of Air-Sea Rescue," by Lt-Cdr. J. S. Sproule. Feb. 21. *Birmingham*, Branch President's Night. Feb. 26. *Hatfield*, "Fairey Delta 2," by R. L. Lickley and L. P. Twiss; *Preston*, "Problems Associated with Non-Metallic Materials in Aircraft," by N. J. L. Megson and E. W. Russell. Feb. 27. *Bristol*, "Servicing of Civil Aircraft," by I. Gregory; *Cambridge*, "Some Aspects of Aircraft Production," by H. Povey; *Yeovil*, Third Henson and Stringfellow Memorial Lecture by S. G. Hooker.

A question of tolerances?





When tooling and jigging limits tend to build up—and in most pipe runs no matter how accurately formed, this is inevitable—there is no easier or cheaper method of closing the gap than Plessiflex. An inherent ability to withstand vibration, high pressures, and high or low temperatures are among the other advantages which Plessiflex offers. Designers are invited to write for full details of the Plessiflex range.

You can forget that tolerances ever presented problems if you use

PLESSIFLEX

inserted lengths of seamless metallic hose

Power Auxiliaries Limited, Kembrey Street, Swindon, Wilts.
Telephone: Swindon 5461
One of the Plessey Group of Companies

PAL 6

TAA Breaks Records with Viscounts

Mr. John P. Ryland, General Manager of Trans-Australia Airlines, recently commented on TAA results for the year ending June 1957. He pointed out that the year had been the second in succession during which TAA has carried more than three quarters of a million passengers, a figure never attained by any other Australian domestic airline. Introduction of more large, speedy Viscount aircraft had enabled TAA to carry the record number of passengers (793,946) on 26,493 separate flights, more than 2,000 fewer than in the previous year.

Pilots have many reasons for preferring the Viscount with its proved and reliable non-powered flying controls.

Viscount experience in service with over 20 airlines is being built into the simple functional cockpit and cabin layout of the new Viscount 810-840—ensuring for both pilots and passengers that comfort and freedom from strain which is now associated with Viscount travel. In this new Viscount the proved dependability of the airframe and the Rolls-Royce propeller-turbine, after ten years of development and 1½ million flying hours, means peace of mind for both crew and passengers. Quiet, smooth flight reduces fatigue and improves efficiency, while the rapid turnround due to ease of maintenance means less worry over schedules.

There is no substitute for experience

VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED WEYBRIDGE SURREY

TGA AT548A

CIVIL AVIATION

Last week de Havilland issued this picture, the first impression of the D.H.121, the Rolls-Royce-powered aircraft chosen by B.E.A. for its first-line equipment in the sixties. A round-up of the controversy surrounding the placing of an order appears on page 167; relevant points from the Commons debate appear on page 174.

RACING SCHEDULES

PLACING of the Britannia into transatlantic service last December resulted in much discussion on this side of the Atlantic on the ethical and operational aspects of "optimistic" scheduling. Outside the U.S. there is no body authorized to check the realism of published timetables, the twin controlling forces of competition on the one hand, and public opinion on the other, apparently being considered to suffice. A quick inspection of B.O.A.C. timetables suggests that, at least as far as the Britannia is concerned, schedules are well within average operational limits, and flight-times might even allow for a proportion of "built-in delay" at take-off.

In contrast to this, American domestic trunk carriers are now being charged by the C.A.B. with offering to the public timetables "which are not reasonably accurate and do not bear a realistic relationship to actual performance." The list of respondents includes American, Capital, Delta, National, T.W.A. and United. Domestic trunks excluded are Braniff, Eastern, Northeast, Northwest and Western.

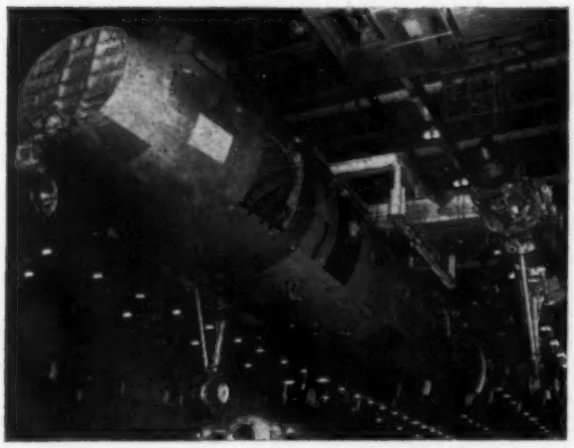
The basis of the C.A.B. case is that this practice is "unfair and deceptive" rather than "unrealistic." Validity of the C.A.B.'s evidence will no doubt be contested. But whatever emerges, the Board's action is a reminder of its duty as a watchdog for the customer, a function which surely needs fulfilling in the international sphere.

VERTOL HELICOPTER AIRLINE

IF New York Airways obtain C.A.B. approval they may become, in April, the first commercial operators of a tandem-rotor helicopter. Mr. Robert L. Cummings, Jnr., N.Y.A.'s president, announced on January 30 that his company had decided (as forecast in *Flight*, December 20) to purchase five Vertol 44Bs (powered by 1,425 h.p. Wright Cyclones) to replace the two Sikorsky S-55s that have been their standard equipment since 1952 and the three S-58s which were added in 1956.

The value of N.Y.A.'s order is £715,000 with spares; the first aircraft will be delivered from the Vertol Aircraft Corporation in Morton, Pennsylvania, in April, three in May and the final one in June. The Sikorsky fleet, complete with tools and spares, is being offered as a package sale by William C. Wold Associates of New York, together with consulting and training assistance from New York Airways personnel.

When the new fleet is available N.Y.A. will operate a new timetable with increased frequencies; a route evaluation with a Vertol 44 was made last autumn. The service between New York's airports and the West Thirtieth Street terminal will be stepped up, and the number of services to Westchester and Stamford, Connecticut, may be increased as well. New equipment should give N.Y.A. the opportunity of meeting a steady demand for helicopter travel in the New York area, and they claim that their subsidy requirement will be reduced as well.



Nearing completion at Fairchild's Hagerstown plant is the first licence-built Fokker F.27 Friendship. See news paragraph on page 188.

PANAM IS USING DOPPLER

A DC-7C of Pan American is being used for evaluation of the General Precision Laboratories Radan Doppler navigator on regular transatlantic service between New York and London. Eighteen crossings have so far been made with this first civilian application of Doppler.

Radan is reported to weigh 89 lb, and to use a four-beam "Janus" system, combined with a compass for sensing groundspeed, drift and heading. Only these values are found, no computer being added to provide other navigational information. It is also stated that the system operates successfully over water, snow or ice.

Comprehensive Doppler navigation equipment has been in standard R.A.F. service for over three years and several hundred U.S.A.F. and U.S. Navy aircraft carry it. Both Marconi and Decca are developing civil Doppler navigators, respectively designated AD.2300 and D.I.A.N. The latter is integrated with the Decca Navigator and Dectra.

AMERICAN AIRLINES' PROFITS HALVED

PRELIMINARY accounts for 1957 must make depressing reading to the 50,000-odd shareholders in the world's largest carrier, American Airlines. That profits would fall was predicted in the 1956 annual report ". . . increases in revenues projected for the year may not equal increases in cost of production. If not, there will be a further reduction in profit margin." Recent pleas by American to the C.A.B. for a 15 per cent fare increase must have led shareholders to brace themselves. But to learn that net profits had fallen from $16.9m to $10.9m must still have come as a severe shock.

Financial figures for 1957 are unaudited and preliminary, but comparison of American Airlines' past preliminary figures with their subsequent final accounts suggests that they are reliable.

The broad picture is that total revenues have increased by only five per cent (from $291.8m to $306.0m) while total costs have grown by as much as eight per cent (from $273.8m to $296.9m). Profit on sale of aircraft has increased slightly from $1.5m to $1.8m.

As regards revenues, that from passenger traffic increased by only four per cent. Mail revenue showed little change, while that for freight and "other" increased respectively by 9 per cent and 21 per cent.

On the cost side, direct and indirect costs each rose by 13 per cent, representing additional outgoings of $31m. Obsolescence and depreciation—a dubious item when in an unaudited form—appears to have been increased by $3m, while interest and miscellaneous charges, previously a substantial credit item, in 1957 cost $32,209 net. Against these cost increases, federal income tax provision fell from $19.4m to $8.3m.

Prospects for 1958 are probably more hopeful as last year's results were depressed by delivery of 19 DC-7Cs and two DC-6Bs at a cost approaching $50m. Although this year will see no additions to American's fleet (the next deliveries being 35 Electras from January 1959, and 30 Boeing 707s from March 1959) progress payments on $240m worth of equipment will be considerable. Another costly item will be interest on the two loans negotiated with insurance companies to reimburse Boeing and Lockheed. The annual interest charge will amount to over $5m.

Seen for the first time at Seattle-Tacoma international airport is the first production Boeing 707. It was testing its I.L.S. equipment.

CIVIL AVIATION . . .

FAIRCHILD SHELVE THE M-185

JUST before the time originally given for completion of Fairchild's executive jet, the M-185, the company announced that production plans had been shelved. It is not known exactly how far work on the prototype had progressed, if at all, but the company have been working on the project since early in 1956, and had completed a fairly elaborate mockup by the spring of 1957. Fairchild have returned the initial payments made by the Continental Car Company for three aircraft, and by two other corporations for a further two.

Fairchild's decision was made, they said, so that the company's facilities could be exclusively devoted to production of the F-27, the prototype of which has fallen behind schedule. The original roll-out date of October 1957 was not met, and there is still no news that the first aircraft has emerged from the Hagerstown plant.

Fairchild's preoccupation with F-27s undoubtedly left insufficient remaining effort for the executive jet—certainly not enough to match the speed with which Lockheed developed the Jetstar, the 185's main competitor for the U.S.A.F. executive jet requirement.

STRETCHED-DOWN VISCOUNT

FORMAL announcement of the local-service Viscount (an appraisal of which appeared in *Flight* last week) was made by Vickers-Armstrongs (Aircraft) on January 30. With the announcement came further details of the Viscount 790's performance, cost and seating arrangements. The high-density version, it may now be said, has 65 seats in alternate rows of five and four at 34in pitch and with a 16in aisle between five-abreast seats; one toilet has been deleted to increase the room available in the 700 fuselage.

Vickers make the point that, although the 790 is a compound of structure and equipment already in production, the local-service aircraft is a factory job, too extensive to be tackled as a conversion by an operator. Some 50,000 hr of design and drawing office work have already gone into the project—which has been described as a "stretched-down" Viscount, smaller than the 800 and with an earlier mark of Dart, but otherwise embodying much of Vickers' latest Viscount design practice.

Because new jigs and tools will be required, Vickers can offer delivery in mid-1959, or eighteen months from the placing of an order. The price has been announced as £380,000 ex-Weybridge, or $1,170,000 in the U.S.—the latter figure taking import duty into account. Whether the local-service airlines can afford this outlay in any quantity is a matter for speculation. Perhaps—with a loan guarantee of 90 per cent of $5,000,000 per carrier from the U.S. Government—the capital can be found, and Vickers sales teams have not encountered U.S. local-service resistance to the purchase of foreign aircraft, provided that is the best for the airlines' needs. Nevertheless, it is not the subsidized airline that supplies the necessary finance, and local business may still look askance at foreign orders.

With the wisdom of long practical experience, Vickers will not quote general operating costs, except to remark that Viscount costs are well-known and can be applied to individual local service routes; seat-mile costs, they say, should be less than those of the DC-3 provided the Viscount is offered as a high-density version, and aircraft-mile costs are five per cent under, say, the Viscount 745 partly because the first cost is about £20,000 less than that of any other Viscount.

The summary below shows the main dimensional and performance features of the V.790. The cruising speed is limited by the tailplane strength; the structural limitation at cruising altitude is the design diving speed V_D (296 kt e.a.s. at 10,000ft). The wing which embodies "the latest 810 spar design, 810 flaps and associated 810 undercarriage design" is stated to be amply strong enough, and one cabin blower has been omitted from the fuselage pressurization system to save weight and to drop the pressure differential from 6.5 to 4.5 lb/sq in. This gives sea level cabin conditions at 10,000ft, but compensates for the increased number of pressurization cycles in this ultra short-haul aircraft.

Dimensions: Span, 93ft 11in; length, 81ft 10in; height, 26ft 9in. Freight hold capacity (standard), 399 cu ft; freight hold capacity (60-65 seats), 174 cu ft.

Weights: Maximum take-off, 61,500 lb; maximum landing, 58,500 lb; zero fuel, 50,000 lb; empty, 37,240 lb. Maximum payload (54-59 seats) 11,620 lb; maximum payload (60-65 seats) 11,555 lb.

Performance: Maximum cruise speed, 320 m.p.h.; guaranteed cruise T.A.S. (58,000 lb, 20,000ft, I.S.A. still air), 305 m.p.h.; corresponding fuel consumption, 2,500 lb/hr. Range (full payload, reserves for 115-mile diversion and 45 min hold at 5,000ft) 800 miles. Take-off distance to 50ft (I.S.A., 61,500 lb) 4,850ft.

A MILLION VISCOUNT HOURS

SHORTLY after the signing of the VC.10 order by Vickers and B.O.A.C., Sir George Edwards, managing director of the aircraft manufacturers, left on a tour of North America. He has been visiting Viscount operators and potential customers of Viscounts, Vanguards and—it can be assumed—of VC.10s, first details of which were released with B.O.A.C.'s order.

Sir George's justification for wearing both jet and turboprop hats may, perhaps, best be gauged from his remarks at a luncheon in New York shortly before the end of his tour. He told his audience that in 1949 he had expressed his belief that the turboprop was the most economical powerplant for medium/short ranges; he still believed that this was the case today and he reminded his American listeners that Britain was the only country in the Western world with operational experience of both pure jets and turboprops.

The Comet had 30,000 hr of airline operating experience, the Britannia over 36,000 hr and the Viscount—nearly ten years after the prototype first flew—had now flown 1,000,000 airline operational hours all over the world. . . . All this was before the first American jet or turboprop airliner had flown on airline routes at all.

Referring to the British aircraft industry, Sir George said that if it had a weakness, it stemmed from some companies being given tasks beyond their capacities. It seemed clear that the changes now being introduced into the industry in England would correct this situation and that a number of smaller but more powerful units would emerge.

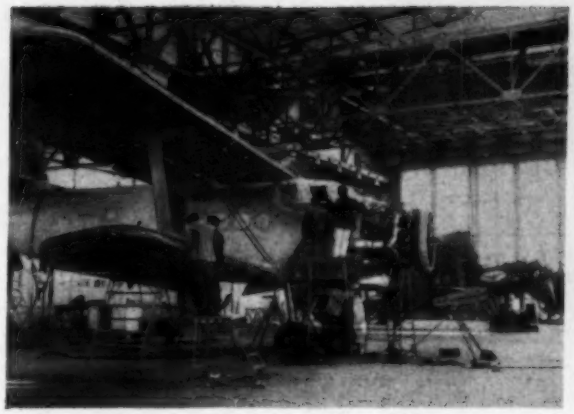
Sir George Edwards was expected to return last week-end. A few days later, another Vickers team, consisting of Mr. C. Hamshaw-Thomas, senior development assistant, and Mr. P. Hall, deputy chief draughtsman, was to leave for the U.S.A. on a sales tour promoting the local service Viscount. They will be joined in the U.S. by Mr. D. Sykes, assistant sales manager for North America.

C.A.B.'s GIFT-HORSE

ASPIRIN, not antibiotic, is the label attached by Mr. Stuart Tipton, President of the Air Transport Association, to the medicine given by the C.A.B. to alleviate the distressing conditions displayed by the U.S. domestic trunk carriers. The Board has decided that for the present the patient needs nothing stronger than a fare increase in the order of 7 per cent.

Insofar as the function of aspirin is to induce a moderate fever, the label attached by Mr. Tipton must be admitted to appear fairly accurate, for his comments on the C.A.B. suggest a high temperature: "the C.A.B. has evaded its responsibilities . . .," "the C.A.B.'s abrupt action . . . has solved nothing . . . ," and "the C.A.B. has chosen again to gamble with the future of the airline industry."

Statements such as these coming from Mr. Tipton, coupled with remarks being made by others, such as Grover Loening ("government bureau hodge-podge at its worst"), are hardly calculated to improve the relationship between doctor and patient. It is just six months since the Board denied the 6 per cent passenger-fare increase proposed by seven domestic trunks. The majority Board opinion stated then that "there is little doubt that



First civil aircraft to be produced by the People's Republic of China, this AN-2 was completed in December. On the right it is being inspected by State Commission officials before its maiden flight.

the drop in earnings which the airlines have reported is due to the impact of new equipment and new routes . . ." and that the carriers had failed to produce "convincing evidence" that higher fares were needed to attract capital for financing jet re-equipment.

Since being denied this 6 per cent increase, the domestic trunks have continued to press with even greater vigour for increases in the order ot 15 per cent, and these suggestions are still being considered under the General Fare Case which opened last November. The interim increase announced last week probably means one thing: The C.A.B. recognize that the airlines' massive procurement programme is threatened by failure to secure funds, and that, much as the Board might wish to see that programme postponed, such delay would be politically unacceptable.

The A.T.A. seeks to demonstrate the inefficacy of the C.A.B. medicine. But its cheerless adjusted-profit estimates do not appear to take account of a possible drop in load-factors resulting from higher fares. Before the increase was announced an industry spokesman forecast that the growth of domestic trunk traffic in 1958 might be as low as 8 per cent. If higher fares reduced this to, say, 5 per cent the industry would find itself in sorry shape.

When the A.T.A. refers nostalgically to the handsome profit margins obtained in 1951 and 1952 it is appropriate to recall that those were the years of record load-factor (much spare capacity having been siphoned off to satisfy defence needs.)

When the experience of recent years is reviewed, two chronic conditions are seen to have infected the domestic trunk industry. The first is a tendency to over-indulge in the latest aircraft, more for reasons of competition than economy. This over-indulgence has been made possible by the C.A.B.'s policy of allowing fast depreciation and of encouraging competition. The second condition, one arising out of the first, is an over-provision of capacity which has dragged load-factors down to a dubious level. In brief, there exists an excess of high-cost capacity.

MORE ABOUT THE RAINBOW

SINCE we published some preliminary details of Republic's new turboprop transport on December 27, further information has been quoted in America. None of the figures given bear the official Republic stamp, but the new Rainbow has been described in a market research brochure distributed to "most of the world's major carriers" by Robert Hewitt Associates Inc., on behalf of Republic.

Similar, but slightly larger than the Viscount, the Rainbow is a good deal more expensive, at a price said by *Aviation Daily* to be about £642,000. It is reported that Viscount-type windows will be used. Maximum payload is 19,200 lb with either General Electric T64 or Dart RDa.10 powerplants and the payload with 15,420 lb fuel is 17,620 lb. The range with reserves at maximum continuous cruising power is 2,000 miles with the T64s and 1,500 miles with the Darts; at maximum economical power it is 2,500 miles and 1,700 miles respectively. Stalling speed is 89 m.p.h.

Preliminary figures for direct operating costs are about $1 per aircraft mile for stage distances of about 1,000 miles, or $0.014 per seat mile (with 80 tourist class seats) over a 500 mile stage and $0.011 over 1,500 miles.

JUST FOR THE RECORD

LAST December bad publicity for the Britannia resulted in the type being put under the microscope in a way that few aircraft have been before. In the light of these examinations, the most searching of which attempted to put some nine months' operations in comparison with those of other aircraft operating at similar periods in their development lives, it could be concluded that—although there was room for improvement—things were not as bad as they had been made out to be. The daily utilization figures were shown to be nearly as high as the best that had been recorded by other aircraft after 12 months in service; Bristol Aircraft quoted the expected Britannia 102 utilization after a year in service as 6½ hr per day against 6 hr 38 min for the DC-7 and 5 hr 39 min for the Constellation L.1049C.

The last figure has been challenged by Lockheed, who say that, after searching their records to see if the comparison was justified "we found that one airline, which we suspect was the one to which Bristol referred, had 5.5 hr at the end of six months, but this experience was far from typical and resulted only from a deliberate scheduling policy rather than from any operating problems. That same airline had 6.7 hr at the end of the first year. However, figures for three other major 1049C Super Constellation operators showed 8.36, 10.00 and 10.60 hr of average daily utilization after the first year."

At the end of the Britannia's first year of service, on February 1, B.O.A.C. announced that the daily utilization achieved was 6¼ hr per aircraft—better than that achieved with any other aircraft in its first year in the Corporation's service. Britannia 102s are now averaging about eight hours a day.

More than 100 hours' test flying has now been completed on Lockheed's Jetstar—now resplendant in its first paint scheme. It is seen here taking off from Burbank.

Taking shape on its jigs at Baginton is the first A.W.650; it is expected to fly before the end of this year ("Flight," November 1, p. 718).

CIVIL AVIATION . . .

BREVITIES

THE possibility that failure of the Britannia autopilot system may have caused the accident to G-ANCA last November is, Bristol confirm, being examined. An autopilot fault during a recent test flight of a production Britannia suggested this possibility.

* * *

The second prototype Lockheed JetStar will be powered with Orpheus engines; it had been expected that four General Electric J85s would be used.

* * *

The Minister of Transport and Civil Aviation has announced that a public inquiry will be held into the accident to a B.E.A. Viscount at Nutts Corner, Belfast, on October 23.

Czechoslovak Airlines (CSA) are to open a Tu-104 service between Brussels and Prague "in the near future."

* * *

The first section of a new civil airport in Peking (reputed to be one of the largest in Asia) will be opened in the spring.

* * *

As a result of crumbling runways at Ratmalana, all air traffic through Ceylon will be diverted to Katunayake from March 1.

* * *

The director-general of Finnair, Mr. L. Grandell, revealed recently that preliminary talks had been held about a possible amalgamation of S.A.S. and Finnair.

* * *

Lack of traffic has led South African Airways to announce that Paris will no longer be served on flights between the United Kingdom and South Africa.

* * *

A Caravelle is at present undergoing cold-weather tests in Sweden. After a week of tests at Bromma airport it will fly to Lulea, in northern Sweden.

* * *

Moscow Radio has announced that the introduction of turboprop Tu-114s, Il-18s and An-10s will result in Aeroflot's passenger traffic increasing in 1958 by over 27 per cent and freight by 17 per cent.

* * *

B.E.A. have rejected a proposal for an air service to Scone Airport, four miles north of Perth. The Corporation estimated that operations from Scone—or from Errol airport, which was rejected previously—would entail an annual loss of £40,000.

PARLIAMENT DEBATES CIVIL AVIATION (continued from page 174)

ties—men from B.O.A.C., the R.A.E. and other Government establishments, such as the National Gas Turbine Establishment and Bristols. I know that on that job they did everything that man could do to get this right—and I believe that they have got it right."

"When the big Britannias start meeting the competition of the Boeing 707s nobody knows which will win. Some say that the turboprop will maintain its position against the big jet, and others say that the big jet will have a great deal of trouble through noise, the high landing speeds required, and many other problems which have to be resolved. It was right for the Corporation to back itself both ways."

MR. MIKARDO: "Whereas the DC-7C was up to specification, the Britannia was well down."

SIR ARTHUR HARVEY: "That is a very serious thing to say . . . my understanding is that the first prototype Britannia was down on specification. However I understand that that has now been corrected and the aircraft is now up to specification. It is wrong for the hon. Gentleman to make a statement which is not accurate."

MR. MIKARDO: "The hon. Member should know that I would not have said that if I did not know that it was accurate . . . The fact is that B.O.A.C. has a large claim on the Bristol company over this aircraft. There must be something not quite right, because one cannot claim for nothing."

SIR ARTHUR HARVEY: "As the Britannia has proved a successful aircraft, will the DC-7C be sold for dollars and further Britannias ordered from Bristol?"

"I was horrified in September and October at the bad publicity put out by B.O.A.C. about the Britannia . . . When similar things happen in America, we are the last to hear about them. The Americans keep very quiet about their failures. Their Stratocruiser was frequently grounded a few years ago, and it was often described as the best three-engined aircraft in the world. The Americans never told us their troubles, and the aircraft went on selling."

The Independent Operators

MR. MIKARDO: "The inhibitions which have been placed upon the Corporations offering capacity in the carrying of troops and freight and for colonial-coach services ought to be withdrawn . . ."

"We should give public support to those private companies which have shown themselves to be willing to work amicably with the Corporations, and withdraw public support from any private company which, as some do, mistakes buccaneering for enterprise."

MR. AIREY NEAVE: "It is interesting to see that in many ways these airlines are doing well. I have often heard grumbles from B.E.A. that the independents are cutting its throat, but B.E.A. is doing well and so are the independent companies. Neither the Corporation nor the independent companies have harmed one another and I shall support any way in which they may get together to their mutual advantage."

Miscellaneous Points from the Debate

MR. WATKINSON: "I should like to see more municipalities going into the airport business and my department getting out of it. . . . Discussions are proceeding with Birmingham, Southampton and Liverpool."

SIR ARTHUR HARVEY: "I ask my right hon. Friend to consider seriously setting up an air policy tribunal, a body of men quite independent of the industry. It should be composed of men like Lord Hives, now retired who got to the top the hard way. Somebody like him as chairman, if he would serve, could do a tremendous job for the country. In America, the Findletter Commission does a great work in this respect. A body such as this could inquire into the Corporations, the independent airlines and fighting services, and into any branch of the industry and advise the Government. In view of the changes in Ministerial appointments, it is necessary that some such body should be in being."

MR. AIREY NEAVE: "The scheme [Air Training Ltd.'s new scheme for pilot training] is very important and interesting as a general air training scheme."

MR. WATKINSON: "We are examining the fascinating project of a monorail, but I cannot give any views about that until the Chief Inspecting Officer of Railways has pronounced on whether he feels that it is a safe form of passenger carrying at the very high speeds which we shall require, and which will be a good deal higher than those in Germany, so that the German model will not necessarily be the answer for this country. We shall also require a bus which can be taken off the monorail and motored round the airport so that we do not have to build a tunnel underneath the airport. This is a fascinating project, but it would not be right to lead the House to believe that it will or will not work. I have to await technical advice. but I shall be very glad if the technical advisers say that it will work."

MR. AIREY NEAVE: "The recommendations of the Millbourn Committee [on London Airport's expansion] are still being considered; I am sorry I cannot say more about that at the moment."

MR. MIKARDO: "The conditions [in the Queen's Building] make it impossible—not difficult, not embarrassing, not uncomfortable, but impossible—for the personnel who have to work there."

Aircraft Noise

MR. WATKINSON: "The Port of New York is at the moment examining the noise level of the Comet 3, and I do not think that it is yet prepared to say whether or not it will let that aircraft in. We shall adopt a similar principle in respect of the Boeing, and all other jet aircraft, not excluding the Tu 104, which the Russians may want to use if they open the proposed Aeroflot service. The Russians know this and have agreed to it."

"I think it right that close [noise] measurement should be made and that we should be satisfied that aircraft designers and manufacturers have made every possible effort to silence the aircraft as far as it can humanly be done."

Gatwick Airport

MR. WATKINSON: "What has happened arose from a mistake in design. The road will certainly be made into a double-track road throughout. At the moment it is a double-track at each end but a single track where it runs under the airport building . . . It is possible to widen it . . . Fortunately, there is room to do it between the pillars which hold the overpass, but work is now going on . . . Her Majesty the Queen has kindly consented to inaugurate [Gatwick] on June 9."

SERVICE AVIATION

Royal Air Forces and Naval Flying News

This Bristol/Ferranti Bloodhound surface-to-air missile, trailer-mounted, was on show at an R.A.F. exhibition at the Drill Hall, Bristol, last week. The first Bloodhound is scheduled to reach the Service in six weeks' time.

Navy Leaves Valley

WITH the passing-out of No. 64 R.N. Pilots' Course recently, its members became the last Naval pilots to receive their Wings at No. 7 Flying Training School at R.A.F. Valley, Anglesey. During the past three years 225 Naval student pilots have completed their advanced flying instruction on Vampire T.11s at No. 7 F.T.S. and then departed for specialist training on Sea Hawks at R.N.A.S. Lossiemouth or AS. Gannets at R.N.A.S. Eglinton. Their training up to Wings standard, on Provosts and Vampires, has been essentially similar to that given to R.A.F. pilots.

Disbandment of the R.N.V.R. Air Branch cut down the number of student pilots considerably, until it was no longer economic to keep open separate basic and advanced schools, and the Vampires—which departed from Valley in twos and threes during the last weeks of January (in lieu of a figure "7" formation which would have been carried out had the airfield not been snowbound)—are joining the Provosts which moved from R.A.F. Syerston to Linton in Yorkshire a couple of months ago. The first combined basic and advanced flying school at Linton will retain the old Syerston title of No. 1 F.T.S. and constitute an experimental set-up with piston and jet aircraft operating from the same airfield. A satellite will be used for emergencies and for "circuits and bumps." This scheme (if it proves successful with the small numbers involved) may well be followed by all Flying Training Schools in the interests of efficiency and economy.

Rear Admiral A. S. Bolt, Deputy Controller of Aircraft at Admiralty, who presented Wings to No. 64 Course, prophesied that the forthcoming White Paper would reveal that new manned aircraft coming into service in the next four or five years would keep everybody in the Fleet Air Arm fully employed.

R.A.F. Valley is a master diversion airfield, where No. 1 Guided Weapon Development Sqn. (equipped with Swifts) is based. There is also an R.A.F. conversion and continuation training squadron.

Proceeding for the moment slightly "cross-wind," A.V-M. R. Ramsay Roe steers his toboggan down the Cresta Run during the recent Inter-Services Championship. The event was finally won by the Army.

Yacht Club Admiral

ONE of the founders (in 1932) of the R.A.F. Yacht Club, Air Chief Marshal Sir Frederick Bowhill was recently made Admiral of the Club as a personal tribute to him and to mark its 25th anniversary.

Air Chief Marshal Bowhill went to sea from H.M.S. *Worcester* at the age of 16, started flying in 1912 and entered the R.A.F. from the R.N.A.S., having been a lieutenant in the Naval Wing of the R.F.C. He has four times rounded Cape Horn under sail.

The R.A.F. Yacht Club (which has its headquarters at Hamble) also marked its 25th anniversary with a successful season, finishing sixth out of 49 clubs in the Royal Ocean Racing Club's points list.

R.A.F. Postings

AMONG appointments recently announced by Air Ministry are the following:—

G/C.s G. Gilchrist to H.Q., 22 Group, as Senior Medical Officer; P. A. Lee to R.A.F. Hospital Weeton, to command and as Senior Medical Officer.

W/C.s W. C. Baird to R.A.F. Hospital Cosford, as specialist in medicine; A. D. Balmain to H.Q., Bomber Command, for technical staff duties; E. J. Brooks to R.A.F. West Raynham, as Station Commander; A. Brown to H.Q., Flying Training Command, for air staff duties; R. Brown to R.A.F. Wittering, to command the Bomber Command Armament School; H. D. Clark to R.A.F. Aston Down, to command No. 20 M.U.; A. S. Duff to Air Ministry, for duty in the Department of the Air Member for Supply and Organization; H. Durkin to Air Ministry, for duty in the Department of the Air Member for Supply and Organization; W. J. F. Fenton, to No. 2 Movements Unit, to command; D. S. Grant to Air Ministry, for duty in the Directorate General of Medical Services; C. G. Harold to H.Q., 64 Group, as Deputy Senior Medical Officer; C. G. St. D. Jeffries as O.C. Flying, R.A.F. Binbrook (not to R.A.F. Lyneham, as previously stated); P. Peters to R.A.F. Northolt, as O.C. Flying Wing; M. O. Richardson to H.Q., 25 Group, as Senior Medical Officer (and Senior Medical Officer at R.A.F. Manby); D. F. Dixon to R.A.F. Dishforth, to command the Transport Command Examining Unit; D. C. H. Simmons to R.A.F. Staff College, Bracknell, for directing staff duties; W. D. Symes to R.A.F. Bruggen, to command; W. G. Welch to Air Ministry, for duty in the Department of the Air Member for Supply and Organization; J. C. Wickham to AAFCE, for staff duties; A. R. Wright to R.A.F. Waterbeach, as O.C. Flying Wing.

S/L.s G. E. H. Hackman to R.A.F. Wilmslow, as O.C. Training Wing (with the acting rank of wing commander); S. Kirtley to R.A.F. Wildenrath, for administrative duties (with acting rank of wing commander).

IN BRIEF

The Royal Australian Navy's first aircraft carrier, *Sydney* (15,700 tons) is to be paid off.

* * * * *

The Duchess of Gloucester is to visit the headquarters of the Royal Air Forces Association in Portland Place, London, W.1, on February 12 and on February 18, as Air Chief Commandant of the W.R.A.F., will take the salute at the W.R.A.F. officer cadets' passing-out parade at R.A.F. Hawkinge.

* * * * *

G/C. J. S. O'Malley, C.B.E., director of rehabilitation at Garston Manor and formerly with the R.A.F. medical branch, died on January 25. He was P.M.O. at A.H.Q. Egypt in 1941-2 and in 1942-3 held the same appointment with the Desert Air Force. He was made C.B.E. in 1944.

* * * * *

On Friday, March 14, the tenth reunion dinner (stag party) for officers of H.Q. 44 Group, Gloucester, and stations is being held. Particulars may be obtained from C. A. Riceman, Palm Court Hotel, Richmond, Surrey.

Tony Addison, best all-round Blackburn apprentice, receives an inscribed wrist-watch from the works director, Mr. T. Bancroft. (See first news item.)

THE INDUSTRY

Blackburn Apprentice Prizegiving

ONE hundred and thirty apprentices of Blackburn and General Aircraft, Ltd., received awards at the company's annual prize-giving at Hull Guildhall on January 20. Proceedings were opened by Mr. Eric Turner, chairman and managing director of the company, in the presence of an audience which included Lord Middleton, Lord Lieutenant of Hull and the East Riding of Yorkshire.

Mr. N. E. Rowe, technical director, said in his address that the aircraft industry could honestly attract young men with a view to giving them better training than they could get elsewhere, and which would be applicable to other branches of the industry.

In the apprentice-training report, Mr. T. A. Wolstenholme, group technical training officer, stated that nearly 400 apprentices were now in training at Brough—the highest number ever reached in peace-time. Educational facilities had been greatly improved, and much help in arranging courses had been given by some of the local educational establishments.

The merit awards were presented by Lord Middleton, who gave a brief address, followed by presentation of the Robert Blackburn Memorial prizes by Mr. Turner, and the Directors' Prize for the best all-round apprentice, won by Anthony Addison and presented by the works director, Mr. T. Bancroft.

Weybridge Overseas Appointments

NEW appointments in the Vickers-Armstrongs (Aircraft), Ltd., sales organization have been announced. They include posts both in Europe and in the Far East.

Mr. A. G. Page, who has been with the sales department since 1953 has been appointed assistant sales manager (Europe and Africa). Until the end of 1956 he was concerned with sales of Vickers aircraft in North America and since that time has covered European and African sales.

Mr. Page went to Vickers after a distinguished career with the Royal Air Force in which he attained the rank of wing commander at the age of 24 and won the D.S.O., D.F.C. and Bar and the Netherlands order of Orange and Nassau. He is officially credited with 15 aircraft shot down. In 1945, whilst still serving with the R.A.F., he was seconded to the company as a test pilot.

Mr. H. C. W. Sharp, who has been a member of the sales department since 1950, now becomes assistant sales manager (Middle and Far East). Mr. Sharp has been concerned with sales in those territories since he joined Vickers, first mainly with military aircraft and after 1952-53 principally with Viscounts.

In the R.A.F. during the war he served in the Middle East and Africa, first as personal assistant to an A.O.C. and later with the Rhodesian Air Training Group as a flying instructor. Before going to Vickers-Armstrongs Mr. Sharp was for two-and-a-half years export secretary of the S.B.A.C.

Mr. A. G. Page (left) and Mr. H. C. W. Sharp.

A New Relay

THE constantly changing needs of the aircraft industry, and its stringent requirements, have caused the Plessey Co., Ltd., of Ilford, Essex, to introduce a new range of relays.

One of these is a 60-amp bridging make relay built to withstand severe conditions of shock, vibration, humidity and altitude. Operating over an ambient temperature range of −65 deg C to +70 deg C, the relay is available either hermetically sealed or dustproof, both versions having identical mechanisms. In common with other Plessey relays in the range it is built with a balanced armature so that operation is not affected by vibration or acceleration. Additionally, the bridging contacts have a wiping action, thus minimizing contact resistance.

The hermetically sealed version, which weighs 10¼ oz (1 oz heavier than the dustproof type), has a moulded terminal shroud and detachable terminal cover, whereas access to the terminals of the latter type is gained by removing the dust cover. Overload capacity of both relays, which are wound for 28V D.C., is 480 amp D.C. at 60,000ft or 600 amp D.C. at lower altitudes, non inductive.

At normal rated current, subject to certain limitations regarding the inductive nature of the controlled circuit, the relays are capable of a minimum of 100,000 make and break operations. The hermetically sealed version is flame- and climatic-proof to D.T.D.1085B.

Importance of the Apprentice

SPEAKING at the annual apprentice prize-giving of George Kent, Ltd., at Luton on January 13, Sir Frederick Mander, M.A., B.Sc., F.I.E.S., chairman of the Bedfordshire County Council, said that apprenticeship was "just as much National Service" as serving in the forces. The apprentice was very important to the nation, and the expenditure of £1m on the new Luton and South Bedfordshire College for Further Education, plus a third of this amount per annum on its upkeep, was evidence of the Council's appreciation of this fact.

Principal prize-winners were J. C. Keeling (Cdr. Kent Challenge Cup), R. Gamble (Sir Walter Kent prize), J. Powell (R. W. Bedford Challenge Cup), and M. J. Robinson (Grout Prize). Cdr. P. W. Kent, R.N., chairman and managing director of the company, presented the awards.

IN BRIEF

The Dart, Tyne, Avon, and Conway engines will be among Rolls-Royce products displayed on the British Industrial Pavilion at the 1958 Universal and International Exhibition at Brussels.

* * *

Responsibility for the metal-finishing division of the Pyrene Co., Ltd., has been taken over by Mr. H. F. Parshall, M.A., T.D., who has been a director since 1947. He succeeds Mr. W. E. Wright, F.C.S., who has retired after some 30 years with the company.

* * *

Electronic equipment to the value of £500,000 has been ordered for the West German defence forces from Decca Radar, Ltd. Research on this particular specialized equipment has been carried out by Decca over the last three years, and other equipment based on the results is also being supplied for civil and military purposes to other countries.

* * *

Preliminary financial results for the year ended September 30, 1957, have been announced by H. M. Hobson, Ltd. Consolidated profits of the group were £849,895, reduced after deducting depreciation and taxation to £373,623. These figures compare with £712,006 and £307,272 in the previous year. The annual general meeting takes place on February 21.

* * *

Mr. Arthur J. Geraghty has been appointed U.K. liaison engineer for Rolls-Royce of Canada, Ltd., Montreal. Mr. Geraghty, who retired from the Royal Canadian Navy on January 1, will remain at the Montreal plant until the spring for familiarization purposes and will then come to England, where he will replace Mr. William Skelding at Derby; the latter is returning to the Canadian company for duties in North America.

Bring us in early...

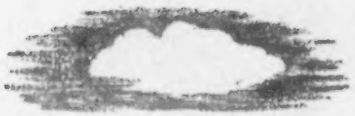
Airscrew have designed and made fans for very many leading British aircraft. Long experience of the ordinary—and the extraordinary—and a habit of making fans that really perform to specification have combined to put Airscrew in an unrivalled position.

AIRSCREW-JICWOOD

AIRSCREW

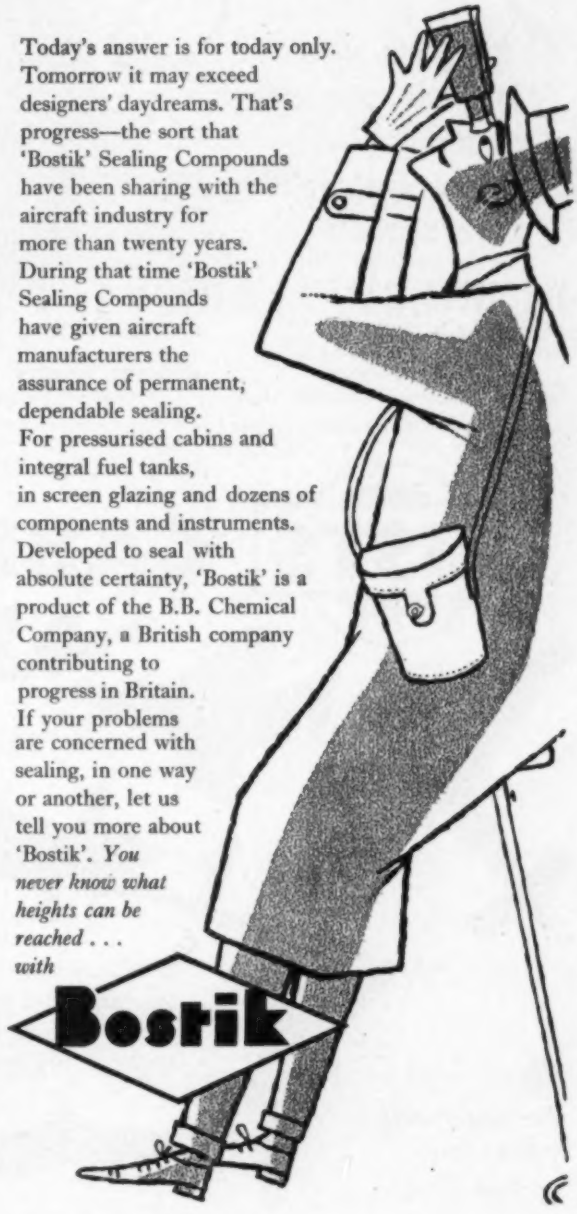
for fans

THE AIRSCREW COMPANY & JICWOOD LIMITED
WEYBRIDGE · SURREY



Just how high can they go?

Today's answer is for today only. Tomorrow it may exceed designers' daydreams. That's progress—the sort that 'Bostik' Sealing Compounds have been sharing with the aircraft industry for more than twenty years. During that time 'Bostik' Sealing Compounds have given aircraft manufacturers the assurance of permanent, dependable sealing. For pressurised cabins and integral fuel tanks, in screen glazing and dozens of components and instruments. Developed to seal with absolute certainty, 'Bostik' is a product of the B.B. Chemical Company, a British company contributing to progress in Britain. If your problems are concerned with sealing, in one way or another, let us tell you more about 'Bostik'. *You never know what heights can be reached . . . with*



'Bostik' is a registered trademark of
B. B. CHEMICAL CO. LTD., ULVERSCROFT ROAD, LEICESTER

These B·A·P Sheet metal fabrications for the JET ENGINE AIRCRAFT INDUSTRY

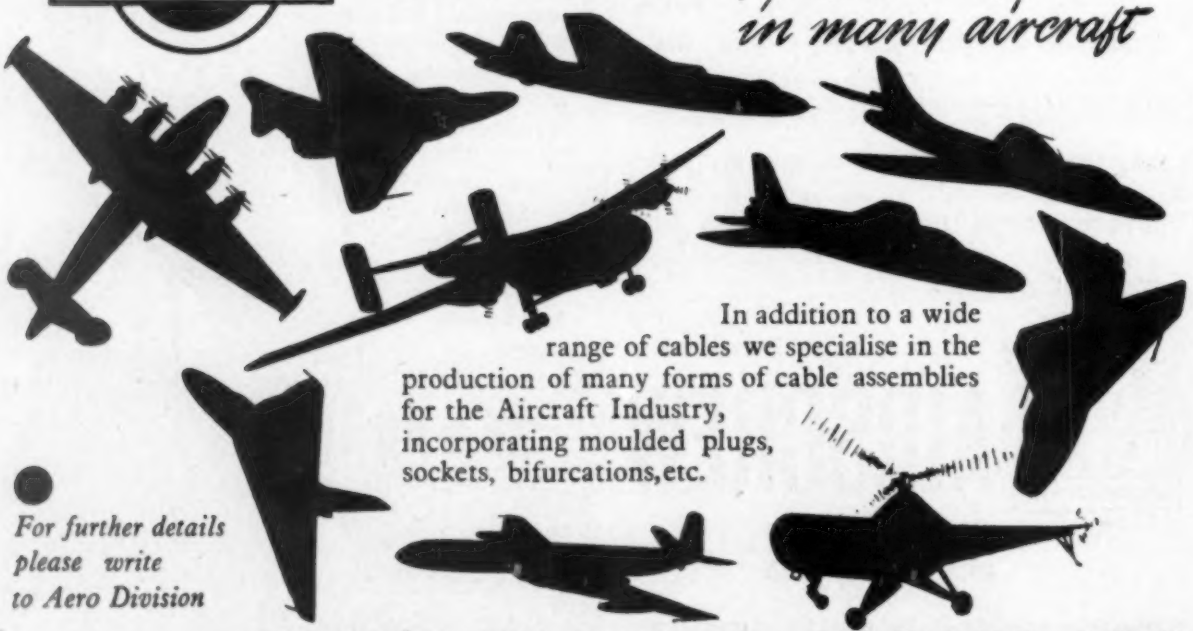
B.A.P repair and overhaul MANY THOUSANDS of main components annually, comprising:- Jet Pipes, Exhaust Units, Insulation Casings, Flame Tubes, Discharge Nozzles, and Air Casings.
We also manufacture on a production basis Flame Tubes, Discharge Nozzles, Exhaust Systems, Jet Pipes, Insulating Blankets, Bellows for Aircraft, Automobile, Marine or other gas turbine developments

Have had close laboratory inspection both metallurgical and mechanical at every stage of production.

A.I.D. and A.R.B. approved.

BURNLEY AIRCRAFT PRODUCTS LIMITED
FULLEDGE WORKS - BURNLEY - LANCASHIRE - ENGLAND
Telephone: 3121 2 and 3203 Burnley (3 lines) Telegrams: "AIRCRAFT" Burnley.
REPAIR DIVISION: BRITANNIA WORKS - QUEENSGATE - BURNLEY - Telephone: 4102
WELDED FABRICATIONS DIVISION: - STONEYHOLME WORKS - GROSVENOR ST - BURNLEY - Telephone: 3184
Associated with RENFREW AIRCRAFT & ENGINEERING CO. LTD., RENFREW, ONTARIO, CANADA.

RIST'S CABLES play their part in many aircraft

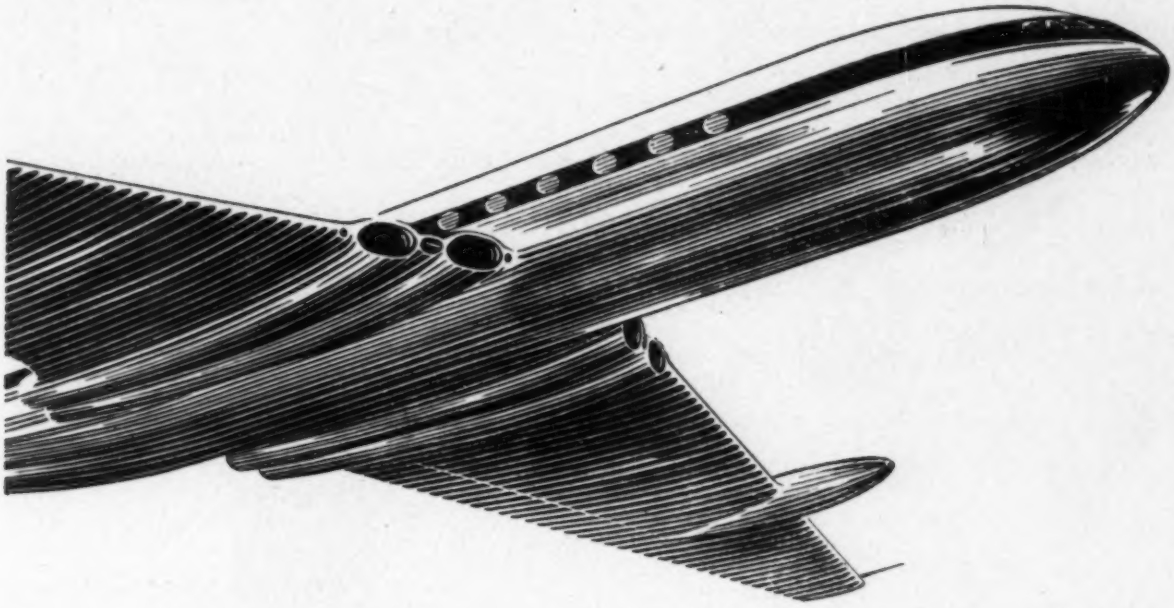


In addition to a wide range of cables we specialise in the production of many forms of cable assemblies for the Aircraft Industry, incorporating moulded plugs, sockets, bifurcations, etc.

For further details please write to Aero Division

RIST'S WIRES & CABLES LTD
LOWER MILEHOUSE LANE · NEWCASTLE · STAFFS

The New Comet for B.O.A.C. and B.E.A.



The New Comet is in full production for British Overseas Airways Corporation and British European Airways, for public service starting about a year from now. It has Rolls-Royce Avon jet engines.

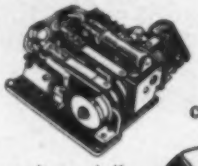
Comets are flying half a million miles a month

Already 14 Comet aircraft are flying with the Royal Air Force Transport Command and the Royal Canadian Air Force, and in daily proving operations with B.O.A.C.

In 18 months they have flown the equivalent of 160 times round the world.

DE HAVILLAND

TIME SWITCHES

Time Switches—non-resetting, resetting and cycling, are widely used on many of to-day's aircraft for such applications as; gas turbine engine and rocket motor starting  inching mechanisms for power operated flying trim controls, camera gun operation, navigation light flashing units, civil and military; de-icing heater mat cycling units automatic bomb release switches and units designed to provide a fixed duration pulse at selectable intervals.

CABIN AIR CONDITIONING CONTROLS

ANTI-ICING CONTROLS

FUEL TANK PRESSURISATION

HOT AIR AND GAS VALVES

ELECTRO-MAGNETIC VALVES

TIME SWITCHES

PRESSURE SWITCHES

PRESSURE REGULATORS

POTENTIOMETERS, ACCELEROMETERS AND PRESSURE TRANSDUCERS

Teddington CONTROLS

REGD. TRADE MARK

TEDDINGTON AIRCRAFT CONTROLS LTD.

MERTHYR TYDFIL, SOUTH WALES. *Telephone: Merthyr Tydfil 666*

LONDON OFFICE: COLNBROOK BY-PASS, WEST DRAYTON, MIDDLESEX. *Telephone: Colnbrook 2202/3/4*

TAC 170

The international pipe couplings of proved efficiency

EQUAL ELBOWS *to suit N.B. pipe sizes ¼" to 1¼"*

EQUAL CROSSES *to suit O.D. pipe sizes ⅛" to 1½" and N.B. pipe sizes ¼" to 1¼"*

BANJO COUPLINGS TYPE 1 *to suit O.D. pipe sizes ⅛" to ½" and N.B. pipe sizes ¼" to ½"*

STRAIGHT COUPLINGS *to suit N.B. pipe sizes ¼" to 1¼"*

ERMETO high pressure couplings have several outstanding qualities, not the least of which is their trouble-free service even in conditions of extreme vibration. Beyond the removal of burrs no work is necessary on the pipe ends. Joints are made in a matter of moments and when required can be broken and re-made any number of times without impairing the pressure tightness. Because of our specialized knowledge we have created a range of fittings to suit almost every conceivable purpose, but we are always prepared to supply fittings to suit individual requirements.

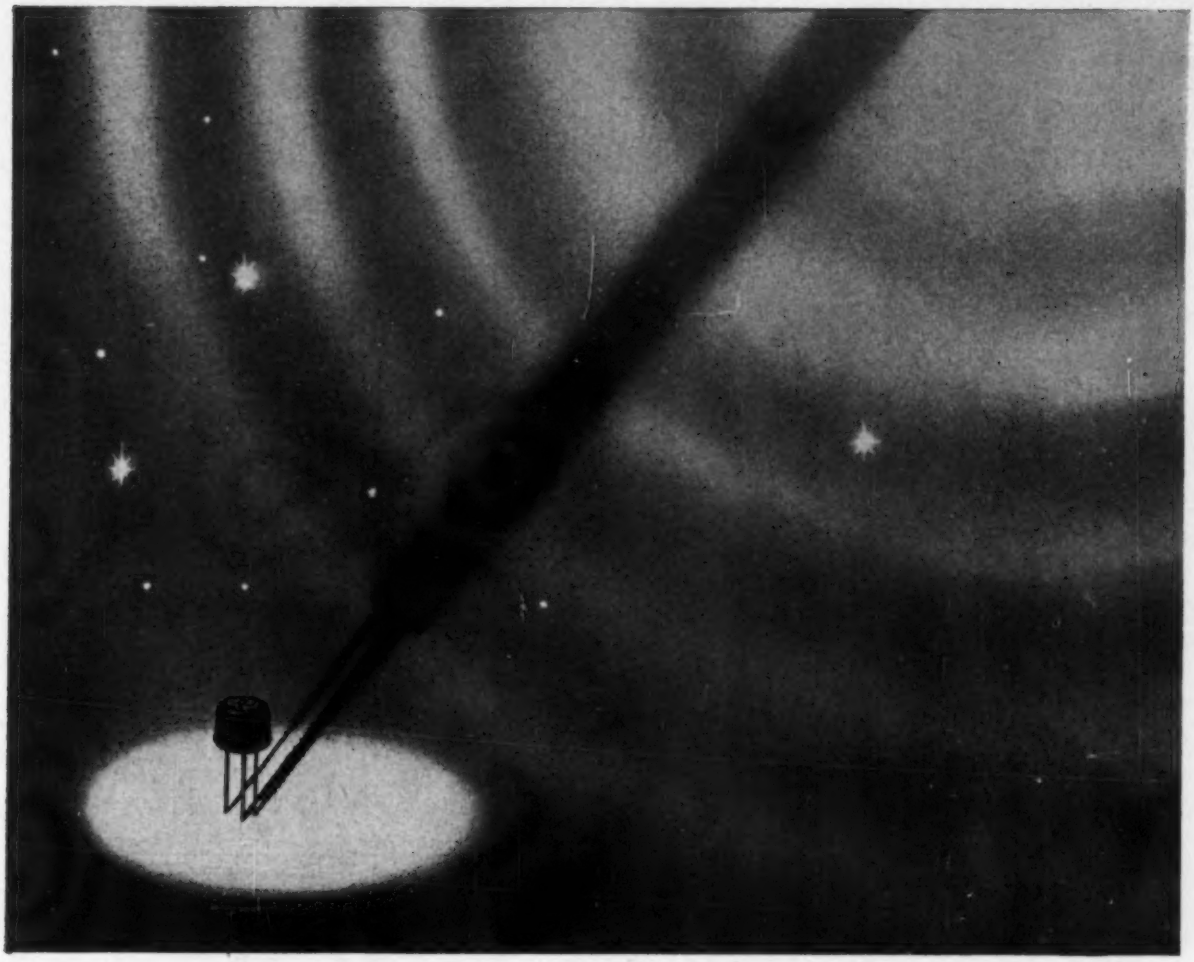
ERMETO

Literature and catalogues gladly sent on request

BRITISH ERMETO CORPORATION LTD

Hargrave Road Maidenhead Berks

Phone: Maidenhead 2271/4 Grams: Grambon, Maidenhead



So small . . .
with so great a future

and in production NOW

You are looking at a silicon transistor. These are the only transistors that will operate in high temperatures. These are the electronic midgets, the brain cells, that can be tucked away in computers, in radar sets, in guided missiles. It is these tiny, tough devices that Texas Instruments know more about than anyone else.

BEHIND US . . . Texas Instruments are a quarter-century old in scientific experience. They are one of the pioneers of semiconductor products, and it was their foresighted skill and theirs alone that introduced silicon transistors and silicon high voltage rectifiers to industry more than three years ago. Today, with all this accumulated knowledge and experience behind them, Texas Instruments Limited has begun production in this country.

AND AHEAD . . . Texas Instruments Limited is at the service of industry. Here at Bedford, we are working today for today—and for the future. Our purpose is to design, develop and manufacture the best there are, and will be, in semiconductor products. Our skill and research are dedicated to that ideal. It is with the essential co-operation of equipment designers and users that entirely new devices will come into being. Together, we shall see their birth.

APPLICATIONS ADVICE AND DEVELOPMENT

Texas Instruments Limited wishes to co-operate with equipment designers. Highly qualified engineers in our Applications Section are ready to advise them about our semiconductor products, and their applications. Technical Data Sheets are available.

TEXAS INSTRUMENTS LIMITED

DALLAS ROAD, BEDFORD

Tel: BEDFORD 68051. *Cables:* TEXINLIM BEDFORD

Freedom of the air!

In and about the clouds they fly,
twisting, diving, without (it would appear)
a care in the world. Test pilots
require nerve, experience and confidence...
and their confidence depends
on the reliability of their machines
and of everything in them.
That is why aero engineers nowadays
specify the Oldham battery,
for they know its quality is superlative.
For long-life reliability and power
the Oldham aviation battery has no equal.

OLDHAM

AVIATION BATTERIES

OLDHAM & SON LTD., DENTON, MANCHESTER. ESTABLISHED 1865

THE
BRITISH AVIATION
INSURANCE COMPANY LIMITED

The oldest and largest office specializing in Civil Aviation

HEAD OFFICE

3-4 LIME STREET, LONDON, E.C.3

Telephone: Mansion House 0444 (6 lines)

BRANCH OFFICES

EDMONTON
317 Empire Building
Tel: 4-2247

MONTREAL
276 St. James Street West
Tel: Avenue 8-6135

TORONTO
44 Eglington Avenue West
Tel: Mayfair 4461/2

JOHANNESBURG
London House
Loveday Street
Tel: 33-3048

CALCUTTÁ
2 Hare Street
Telephone: 23-3274

BRUSSELS
99 Rue de la Loi
Telephone: 12.00.05

Suppliers of **machined** *and* **fabricated components** *in all Plastics and Allied materials to individual requirements. Precision guaranteed.*

UHLHORN BROS. LIMITED
EST. 1887

EBONITE (Vulcanite)
RESILON (Synthetic resin bonded paper)
RESILON (Synthetic resin bonded fabric)
COROSITE (Acid resisting material)
GLASS FIBRE LAMINATES
VULCANISED FIBRE (Red, Black or Grey)
FEROBESTOS ETC.

Telephone: CLE 0145/9 Telegrams: UHLHORN, AVE, LONDON

UHLHORN BROS. LTD.,
OLIVER HOUSE,
51/53 CITY ROAD, LONDON, E.C.1

ENGLISH ELECTRIC COMPANY LIMITED

SENIOR STRESSMAN

Applications are invited from suitably qualified and experienced Stressmen, for the above position in the Airframes Department of our Guided Weapons Division at Stevenage.

This is a senior appointment and associated with a salary up to about £1,400 for the right man.

Housing assistance will be available.

Please apply to

Dept. C.P.S., 336/7 Strand, W.C.2, quoting Ref. F1310D.

More than equal to the extra service demanded

PIRELLI-GENERAL CABLES

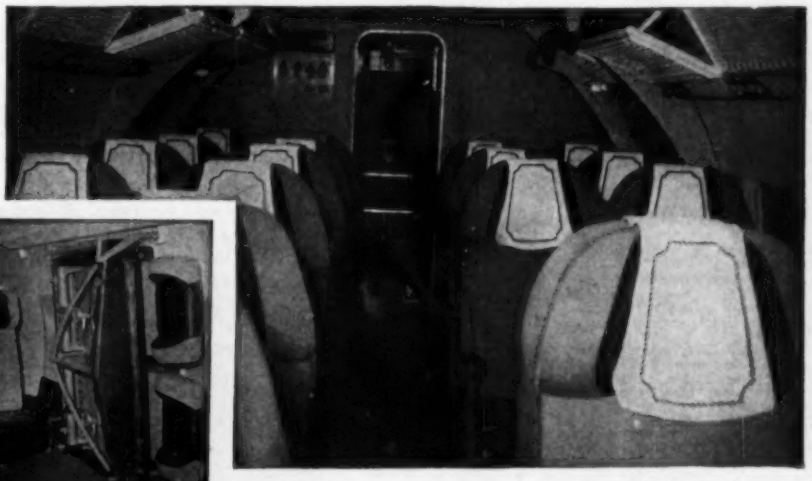
ORDER FROM THE G.E.C.

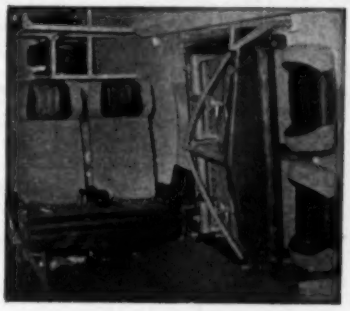
The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2

RUMBOLD

HANDLEY PAGE HERALD

Fitted with seats for 36 First Class or 44 Tourist passengers. Seats which fold up against the fuselage side for freighting can be fitted as shown on the right. All seats and interior decorations manufactured and supplied by Rumbolds.





L. A. RUMBOLD & Co., LTD., KILBURN, LONDON, N.W.6

TELEPHONE: MAIDA VALE 7366-7-8

FLIGHT and AIRCRAFT ENGINEER

PRESS DAY — *Classified advertisement "copy" should reach Head Office by* **FIRST POST THURSDAY** *for publication in the following week's issue subject to space being available.*

CLASSIFIED ADVERTISEMENTS

Advertisement Rates. 5/- per line, minimum 10/-, average line contains 6-7 words. Special rates for Auctions, Contracts, Patents, Legal and Official Notices, Public Announcements, Public Appointments, Tenders 6/- per line, minimum 12/-. Each paragraph is charged separately, name and address must be counted. All advertisements must be strictly prepaid and should be addressed to FLIGHT Classified Advertisement Dept., Dorset House, Stamford Street, London, S.E.1.

Postal Orders and cheques sent in payment for advertisements should be made payable to Iliffe & Sons, Ltd., and crossed & Co.

Trade Advertisers who use these columns regularly are allowed a discount of 5% for 13, 10% for 26 and 15% for 52 consecutive insertion orders. Full particulars will be sent on application.

Box Numbers. For the convenience of private advertisers, Box Number facilities are available at an additional charge for 2 words plus 1/- extra to defray the cost of registration and postage, which must be added to the advertisement charge. Replies should be addressed to "Box 0000, c/o Flight," Dorset House, Stamford Street, London, S.E.1.

The Publishers retain the right to refuse or withdraw advertisements at their discretion and do not accept liability for delay in publication or for clerical or printer's errors although every care is taken to avoid mistakes.

AIRCRAFT FOR SALE

TRAVELAIR, LTD.
for Private, Executive and Commercial Aircraft, offer these very special aircraft.

MILES GEMINI 3B, Gipsy Major 10 engines with low hours. New C. of A. just issued. Equipped with fully crystallized 36-channel Murphy V.H.F., and radio compass, also fitted with low drag flaps. Finest value in U.K. Price at only £3,850.

MILES MESSENGER. This aircraft is not the cheapest, but it is certainly the best. The aeroplane has flown only 577 hours since new, and only 32 hours since completely rebuilt. Cirrus Major 3 engine fitted. Equipped with Plessey P.T.R.61.E V.H.F.; also leather upholstery; and the condition is as new. £1,850.

AUSTER ALPHA. This aircraft was purchased new less than one month ago at £2,113, and is being resold in favour of a larger type. Fitted with starter generator, navigation lights, silencer, carpets, heater, and wired for radio. This is an opportunity to acquire a virtually new aircraft at a considerably reduced price. Offers required.

H.P. Terms arranged for all aircraft we sell.

TRAVELAIR, LTD.,
115 Oxford Street, London, W.1. GER. 3382.
[0609

R. K. DUNDAS, LTD.,

Offer An Exceptional D.H. Dove,

Gipsy Queen 70 Mk II Engines, Full De-icing.

AIRFRAME hours 2,115 since new, engines 351 since complete overhaul. Good radio is fitted, including VHF radios, ILS, and radio compass. This eight-seater Dove is offered at £18,000.

FULL details on all aircraft on application to:

R. K. DUNDAS, LTD., Dundas House, 59 St. James Street, London, S.W.1. Tel.: HYDe Park 3717. Cables: Dundasaero, London. [0559

ROLLASONS for Tiger Moths. CROydon 5151. [0130

D. H. DOVE aircraft. Available immediately. Channel Airways, Southend Airport, Essex. [0031

GEMINI 1A. Radio, single flying control. C. of A. to 29-8-58. £1,750.

GEMINI 1A. Radio, dual control. C. of A. expires 2-5-60. £2,150.

HORNET MOTH. Radio, generator, starter. C. of A. expires 15-7-59. £900. Further details from Luton Flying Club, The Airport, Luton. Tel.: Luton 4426. [6562

VENDAIR of Croydon Airport offer choice of three Auster Mk V aircraft. Low engine hours. Vendair, CROydon 5777. [0603

PIPER AIRCRAFT. Tri-Pacers—Apaches—Super-Cubs. The sole agents for Great Britain and Ireland are Irish Air Charter, Limited, 62 Merrion Square, Dublin. Tel. 62791. [0200

STILL at winter prices! Proctor Mk 4, radio, 4 seats, requires overhaul, and slight repair. £240. C. of A. expired. Also Mk. III, 4 seats, 3 year C. of A. £425 or near. Radio extra optional. Box No. 4048. [7545

BEAVER DHC2 at present in operation on scheduled passenger services. Tenders invited before March 15 by Director of Civil Aviation, the Airport, Kuala Lumpur, Malaya, from whom particulars can be obtained. [7505

BELFAIR TIPSY, 2 str., full dual. Recent conversion to cabin included new C. of A., embracing engine overhaul and respray white and blue. Cruise 100 m.p.h., rate of climb 700 f.p.m. Fuel 3 g.p.h. Whole aircraft only 200 hours from new. At present on new permit. £800. Barton Flying Group, Barton Airport, Manchester. BLA 7407 business hours. [7549

AIRCRAFT WANTED TO HIRE

LARGE independent operator wishes to hull hire up to 4 Dakota aircraft (large freight door essential) for operations abroad. Minimum period required six months, commencing April 1958. Please state terms to Box No. 4039. [7540

W. S. SHACKLETON LTD.

EUROPE'S LEADING AIRCRAFT BROKERS

are proud to offer

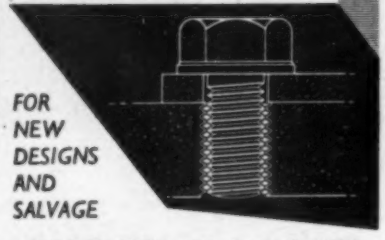
Two one only

AER LINGUS DAKOTAS

Full airline radio, 32 passenger seats, superbly maintained, ready for service anywhere—NOW. Zero hours on engines and propellers within 7 days.

W. S. SHACKLETON LTD.
175 PICCADILLY, LONDON, W.1

WIRE THREAD INSERTS



FOR NEW DESIGNS AND SALVAGE

CROSS MFG. CO. (1938) LTD
COMBE DOWN, BATH
TEL: COMBEDOWN 2355/8

AIRCRAFT WANTED

PRIVATE executive and commercial aircraft required immediately. Travelair, Ltd., 115 Oxford Street, London, W.1. GER. 3382. [0612

AIRCRAFT ACCESSORIES AND ENGINES

GIPSY MAJOR ENGINES

GIPSY MAJOR Mk 10, Mk 2 and 10 Mk 1 engines for early delivery. Nil hours since complete overhaul. Gipsy Major Mk 1, Mk 1c and Mk 1d engines. Nil hours since complete overhaul.

ALSO in stock a number of spare components which include aluminium cylinder heads, fuel pumps, screened ignition harness, etc. Offered in used condition, either overhauled and A.R.B. released or "as is." For full details apply Mitchell Aircraft, Ltd., The Airport, Portsmouth. Tel 717641. [0351

ROLLASONS are specialists in the overhaul of all Gipsy engines. CROydon 5151. [0133

HAVE YOU a reliable source of supply for your spare instruments and accessories? If so, congratulations, but you may still do better by contacting: A. J. WALTER, Gatwick Airport, Horley, Surrey. Tel.: Horley 1420 and 1510 (ext. 105/6). Cables: Cubeng, London. [0268

PROPELLERS, de Havilland VP type, suitable Proctor, Rapide, etc. Also Proctor fuel tanks, undercarriages, etc. Staravia, Blackbushe Airport, Camberley, Surrey. [0299

PHILLIPS & WHITE, LTD., offer from stock instruments and instrument parts. Navigational equipment, electrical components, airframe parts and hydraulic components and parts. Engine spares for de Havilland Gipsy Major and Queen series, also Armstrong Siddeley Cheetah IX, X, XV spares. Stock lists available. 61 Queen's Gardens, London, W.2. Tel.: Ambassador 8651, 2764. Cables: Gyrair, London. [0466

ENGINE Overhauls. Hants and Sussex Aviation Limited, offer Britain's most comprehensive complete overhaul service, magneto overhaul service and components and spares supply. Specializing in all de Havilland and Gipsy range including Queen 30 series. United Kingdom distributors of Continental and agents for Lycoming. Also provide full cover for Cirrus range and Cheetah series. Most types available on exchange. Engines, Components and Spares shipped to all parts of the world. Address: The Airport, Portsmouth, Hants. Telephone: 73947. [0711

AIR PHOTOGRAPHY

MORSE Film Developing Units and Film Dryers, Continuous Film Printers; Argon and Mason Contact Printers; Water Supply Kits; Glazing Machines; F.24 Spiral and Spool Developing Outfits; K.17; F.52; F.49; and F.24 Cameras, Mounts, Lenses, Magazines, Controls, Vacuum Pumps, Motors and Spares for above Cameras; 16 m/m and 35 m/m Cameras, Projectors and Spares. Also large quantity of Aerial Film (all sizes). A. W. Young, 47 Mildenhall Road, London, E.5. Tel.: AMHerst 6521. [0290

HELICOPTERS

HELICOPTER charter. Machines available U.K. and overseas. Autair, Ltd., 75 Wigmore Street, London, W.1. Tel.: WELbeck 1131. [0021

HELICOPTER Services, Ltd., offer their aircraft for all helicopter services. 96 Piccadilly, London, W.1. Phone: GRO. 5495/6. [0800

RADIO AND RADAR

24V. Ekco 11-channel. £60. Luton Flying Club, Ltd., The Airport, Luton. [7562

LIGHT Aircraft Owners—4 and 10 channel VHF transmitter/receivers for sale, cheap. Box No. 4138. [7564

MARSHALL

AIRPORT WORKS CAMBRIDGE

AIRFRAME INSPECTORS

ELECTRICAL INSPECTORS

required for work offering good long-term prospects on

MULTI-JET AND TURBO-PROP CIVIL AIR LINERS

Single lodging accommodation.

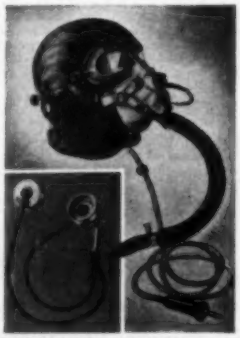
Subsistence allowance to married men.

New houses available under company's assisted housing scheme.

Suitable applicants will be offered **Staff Rates and Conditions** including Contributory Superannuation.

Write, call or 'phone for interview Cambridge 56291. Ext. 36.
EMPLOYMENT OFFICER

FLYING **HELMETS** of all types including **LEATHER CELLULAR DRILL** • **OXYGEN MASKS** • **TELEPHONE RECEIVERS** • **FLYING GOGGLES**



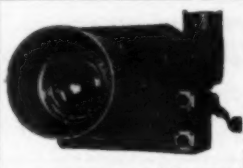
MASK TUBE ASSEMBLIES, SPARES, etc.

We are the complete stockists for pilots' personal flying equipment of civilian and service pattern. *Terms to Flying Clubs.*

Send for free leaflet.

Lewis LIMITED

(Dept. F.)
124 GT. PORTLAND ST
LONDON, W.1
Tel. Museum 4314
Grams: Aviakit, Wesdo, London



K.24 CAMERAS
F2.5
7" Coated Lens
click stops
Accommodates 100 exposures 5" wide film 24v motor or manually operated, all spares, magazines and film available from stock.
PRICE £18 10s. 0d. EACH

K20, K8AB, K19B, F95, F52, G45, aircraft cameras, film spares, and developing tanks available from stock.

SMITH'S MOTORISED DEVELOPING TANKS, DRYERS, STATE YOUR REQUIREMENTS

Air Survey Dept.

Harringay Photo Supplies
423 Green Lanes - - London, N.4
MOUntview 5241/2

The . . .
British Air Line Pilots Association
95 MOUNT STREET, W.1
Tel.: Grosvenor 6261

Membership open to all commercial and Service pilots. For full details concerning objects and particulars of membership please write to the General Secretary.

CLUBS

HERTS AND ESSEX AERO CLUB, Stapleford Tawney Aerodrome. M.C.A. approved private pilot's licence course. Auster, Gemini, and Tiger aircraft. Trial lesson 35s. 15 miles centre of London. Central line underground to Theydon Bois, bus 250 to club. Open every day. Tel.: Stapleford 210 [0230

EXETER AERO CLUB. Course approved for Private Pilot's Licence. Auster and Tiger Moth aircraft £3 7s. 6d. per hour, reduced solo rates for contract hours. Gemini and Messenger aircraft also available. Instructors' courses, charter flying, pleasure flights. Luxurious club house, squash court. Exeter Airport. Tel.: Exeter 67433. [0343

CONSULTANTS

M. J. CONRY, Esq., Consultant and Broker. Executive and transport aircraft bought, sold, financed. Specialist in all Douglas equipment. Brackens, Dormans Park, nr. E. Grinstead, Sussex. Dormans Park 345. [7546

BALL BEARINGS

NEW Ball and Roller Bearings, over 4,000,000 in stock in more than 4,000 types. Britain's largest stocks. Stock list available. Claud Rye, Ltd., 895-921 Fulham Road, London, S.W.6. RENown 6174 (Ext. 24). [0420

CLOTHING WANTED

R.A.F. officers' uniforms purchased; good selection of R.A.F. officers' kit for sale, new and reconditioned. Fishers, Service Outfitters, 86-88 Wellington Street, Woolwich. Tel.: Woolwich 1055. [0567

CONTACT LENSES

MODERN CONTACT LENSES CENTRE 7 (D.1), Endsleigh Court, W.C.1. Deferred Terms. Booklet sent. [0342

PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE AIR TRANSPORT ADVISORY COUNCIL give notice that they have received the undermentioned applications to operate scheduled air services:

FROM British European Airways Corporation of Keyline House, Ruislip, Middlesex, for the following Normal Scheduled Services to be operated initially with Viscount and later with Vanguard aircraft for the carriage of passengers, supplementary freight and mail at a frequency in accordance with traffic demand for 10 years from date of approval:

APPLICATION No. 1614 for a service between London and Alicante.

APPLICATION No. 1615 for a service between London and Turin.

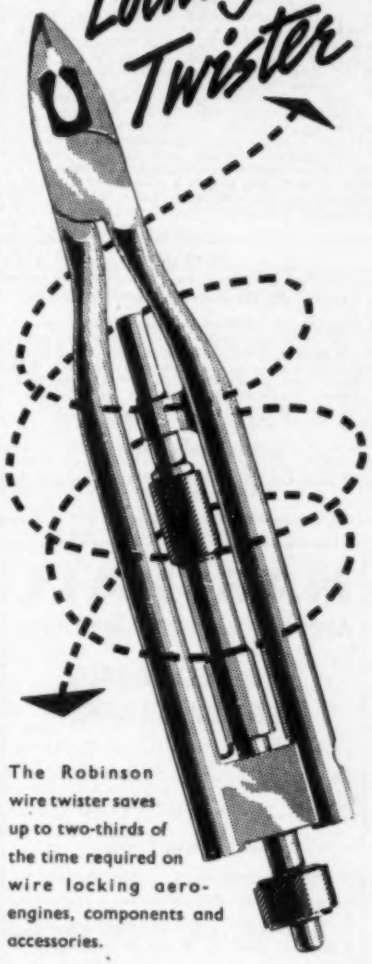
APPLICATION No. 1613 from C. G. Claydon of 236 Old Bedford Road, Luton, Beds., for a U.K. Internal Service with Viking aircraft for the carriage of passengers, supplementary freight and mail on the route Luton-London (Blackbushe) (tech)-Jersey at an initial frequency of up to five return flights weekly increasing later according to demand from 1st May to 30th September each year for seven years from 1st May, 1958.

APPLICATION No. 1616 from Airwork, Ltd., of 35 Piccadilly, London, W.1, for a Colonial Coach Service with Viscount aircraft for the carriage of passengers and supplementary freight on the route London Airport-Algiers (tech)-Tamanrasset (tech)-Kano-Lagos at an initial frequency of one return flight fortnightly increasing in accordance with traffic demand, for 10 years from 1st April, 1958.

APPLICATION No. 765/2 from Eagle Airways, Ltd., of 40 Edgware Road, London, W.2, for an amendment to the terms of approval of the Normal Scheduled Service which they are authorised to operate on the route Manchester (Ringway)-Brussels-Frankfurt, so as to permit them to operate on the route Manchester (Ringway)-Brussels-Frankfurt (optional).

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on 30th July, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [7557

The Robinson Locking Wire Twister



The Robinson wire twister saves up to two-thirds of the time required on wire locking aero-engines, components and accessories.

Universally adopted by manufacturers, operators and Air Forces for greatest efficiency on assembly and maintenance.

Write for New Illustrated Brochure

DOUGLAS KANE LIMITED

5 New Quebec Street
London W.1
Telephone: Paddington 6364

PUBLIC APPOINTMENTS

AERONAUTICAL Inspection Service: Radar and Wireless Divisions. Vacancies exist for Examiners (unestablished) at R.A.F. Units at Carlisle, Stafford, Handforth, Henlow, Bedfordshire and the Gloucestershire and Wiltshire area. City and Guilds Intermediate Group certificate in telecommunications engineering or equivalent theoretical knowledge with experience in industry or Services required. Salary range £625-£820 (men). Prospects of promotion and establishment. Age up to 55 years. Application forms from Air Ministry, C.E.4h, Cornwall House, Stamford Street, London, S.E.1, or from any Ministry of Labour and National Service office (quoting Borough Order No. 111/066.41). [7552

EXPERIMENTAL Officer required at Ministry of Supply; Royal Radar Establishment, Pershore, Worcs., for work on Stress Analysis and direction of mechanical tests associated with design approval of aircraft structural modifications necessary by installation of special equipments in various types of Civil and Military Aircraft. Should have at least H.N.C. or equiv. and not less than 3 years experience of stress problems associated with aircraft structures. Engineering apprenticeship or engineering experience an advantage. Appointment unestablished but possibility of establishment through Civil Service Commission. Salary range £920—£1,130 (male), minimum age 26 years. Forms from M.L.N.S., Technical Training and Scientific Register, 26 King Street, London, S.W.1, quoting C.789/7A. [7556

TUITION

CIVIL PILOT/NAVIGATOR LICENCES

AVIGATION, LTD., provides full-time or postal tuition, or a combination of either of these methods to suit individual requirements, for the above licences. Classroom instruction can be provided for A.R.B. General, certain Specific Types and Performance Schedule examinations. Link Training Dept. at MONarch 1364.

FOR full details apply to the Principal.

AVIGATION, LIMITED,

30 Central Chambers, Ealing B/way, London, W.5. Tel.: Ealing 8949. [0248

MARSHALL

AIRPORT WORKS CAMBRIDGE

SKILLED AERO ELECTRICIANS

FOR INSTALLATION AND TESTING
Electrical Systems in Modern Aircraft.

Overtime and Production Bonus Ensure

Good Average Earnings

Single Lodging Accommodation Available

Subsistence for Married Men

Write, Call or 'Phone
Cambridge 56291, Ext. 36
EMPLOYMENT OFFICER

MINISTRY APPROVED COURSES FOR
COMMERCIAL PILOT INSTRUMENT RATING

All subjects for professional licences and ratings including Academic Technical, simulated and practical flying. Home Study excellent alternative.

- Individual teaching
- Refresher Courses
- Officially approved by the Institute of Army Education for Forces Correspondence Colleges

Full details from your Station Education Officer or

London School of Air Navigation Ltd.

13 Grosvenor Sq., Knightsbridge, London, S.W.1
KEN 8221 Flying Base: Croydon Airport

TUITION

AIR SERVICE TRAINING

The only fully equipped private School of Aviation. Specialist staff, comprehensive equipment and full residential and recreational facilities within the School ensure the soundest training for an aviation career.

M.T.C.A. APPROVED COURSES

for private and commercial pilots' licences and maintenance engineers' licence in categories "A" and "C."

HELICOPTER COURSES

for private and professional licences. Details available from the Commandant.

AIR SERVICE TRAINING, LTD.

Hamble, Southampton. Tel.: Hamble 3001/9. [0970

A SUCCESSFUL career for your son.

AERONAUTICAL, technical and practical training for all branches of aeronautical engineering. Diploma course leads to executive appointments in civil aviation design and development draughtsmanship, maintenance, etc. Extended courses to prepare for A.F.R.Ae.S. and A.M.I.Mech.E. examinations. Write for prospectus to Engineer in Charge, College of Aeronautical Engineering, Chelsea, London, S.W.3. FLAxman 0021. [0019

SURREY Flying Club, Croydon Airport. M.C.A. approved for private pilots' licences. Open seven days a week. Croydon 7744. [0293

LEARN to fly during your holidays! Beginners' Gliding Courses, also Olympia conversions, from £12 12s. inclusive. Send s.a.e. to Dept. 2, Lasham Gliding Centre, Alton, Hants. [7518

FREE! Brochure giving details of courses in all branches Aero Eng. covering A.F.R.Ae.S., M.C.A., exams, etc. Also Courses for all other branches of engineering. Write E.M.I. Institutes, Dept. F26, London, W.4. (Associated with H.M.V.) [0964

A.F.R.Ae.S., A.R.B. Certs., A.M.I.Mech.E., etc.: on "no pass, no fee" terms. Over 95 per cent successes. For details of exams, and courses in all branches of Aeronautical work, Aero Engines, Mechanical Engineering, etc., write for 144-page handbook—free. B.I.E.T. (Dept. 702), 29 Wright's Lane, London, W.8. [0707

LEARN to fly, £32; Instructor's Licences and Instrument flying for £3 15s. 0d. per hour. Night flying £4 15s. 0d. per hour. Residence 6 guineas weekly. Approved M.C.A. Private Pilot's Licence course. Specialized course for Commercial Pilot's Licences. Wiltshire School of Flying, Ltd., Thruxton Aerodrome (Andover Junction 1 hour 15 minutes from Waterloo), Hants. [0253

SOUTHEND-ON-SEA Municipal Air Centre and Flying School. Comprehensive training for all pilots' licences, rating and endorsements. Special facilities for instrument, night-flying and commercial pilot licences. Chipmunk aircraft. Link training to full instrument rating standard. No entrance fee or subscriptions. M.T.C. approved 30-hour course. Municipal Airport, Southend-on-Sea, Essex. Rochford 56204. [0452

FOR SALE

AIR COMPRESSORS

PORTABLE 6 c.f.m. up to 450 lbs. sq. inch if required.

VILLIERS petrol engine. Pneumatic tyres. Price—each. £50.

WILLIAM R. SELWOOD LIMITED

CHANDLER'S FORD, HANTS. Phone 2275. [7508

STR9X 10-Channel Transmitter/Receivers, A.R.B released, ex-stock. Staravia, Blackbushe Airport, Camberley. [0297

MISCELLANEOUS

BAROMETERS. Kelvin and Hughes manufacture for Directorate Atomic Energy. Exceptionally sensitive and accurate. Scale 0-1050 milli-bars. Exceptional opportunity. Staravia, Blackbushe Airport. Camberley, Surrey. [0298

AIRCRAFT SPRING WASHERS

TO B.S. SPECIFICATION S.P.47

CROSS MFG. CO. (1938) LTD., COMBE DOWN, BATH

NOTICES

NO. 1 S.F.T.S. (I) Ambala, 11th Reunion, Chevrons Club, N.W.1, Saturday, 15th March. Details from Stan Booth, 28 Dene Road, New Southgate, N.11. [7560

PACKING AND SHIPPING

R. AND J. PARK, LTD., 143/9 Fenchurch Street, E.C. Tel.: Mansion House 3083. Official packers and shippers to the aircraft industry. [0012

TOM M. SCOTNEY, LTD., St. Ives, Hunts. Tel.: St. Ives 2421. Packaging Engineers. Designers and Manufacturers of Engine-, Jet Pipe-, and Aircraft Component-Containers. [7459

PATENTS

THE Proprietors of British Patent No. 613,655 for "Improvements In Or Relating To Electric Heating Elements, Particularly Applicable To De-icing," desire to enter into negotiations with a firm or firms for the sale of the patent or for the grant of licences thereunder. Further particulars may be obtained from Marks & Clerk, 57 and 58, Lincoln's Inn Fields, London, W.C.2. [7542

SERVICES OFFERED

MAGNAFLUX CRACK DETECTION

STARAVIA of Blackbushe Airport, Camberley, Surrey, offer the facilities of their fully A.R.B. approved non-destructional testing laboratory to aircraft manufacturers and operators. Special attention to A.O.G. requirements.

Phone: Camberley 1600—Ext. 238. [0291

REPAIRS and C. of A. overhaul for all types of aircraft. Brooklands Aviation, Ltd., Civil Repair Services, Sywell Aerodrome, Northampton. Tel.: Moulton 3251. [0307

BLACKBURN AIRCRAFT

SENIOR DRAUGHTSMEN & TECHNICIANS

We have a number of excellent openings for experienced Draughtsmen and all grades of Technicians with a sound aeronautical background to work on an advanced high-speed jet aircraft or in the development of freight and transport aircraft.

If you are an A.F.R.Ae.S. or possess an equivalent qualification and have supervisory ability, there are senior posts still to be filled.

Please write to the

Technical Staff Manager,
Blackburn and General Aircraft, Ltd.,
Brough, E. Yorks

stating whether you prefer to work in our Brough, London, Leeds or Dumbarton (Scotland) Design Office, all of which are engaged on original design work.

FREE! TO AMBITIOUS ENGINEERS 144-PAGE BOOK

Full details of the easiest and quickest way to prepare for A.F.R.Ae.S., A.R.B. Licences, B.Sc.(Eng.), A.M.I.Mech.E., City & Guilds, and hundreds of Home Study Courses in all branches of Aeronautical, Mechanical & Electrical Eng., Draughtsmanship, R.A.F. Maths., etc., are given in this valuable book. Our Courses have been approved by Royal Aeronautical Society and many B.I.E.T. Students have obtained First Places in the A.F.R.Ae.S. Exams.

We definitely Guarantee
NO PASS—NO FEE

A copy of this enlightening Guide to well-paid posts will be sent on request—FREE! Write: B.I.E.T., 306 COLLEGE HOUSE, 29-31, WRIGHT'S LANE, LONDON, W.8.

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY

SITUATIONS VACANT

BLACKBURN AND GENERAL AIRCRAFT LIMITED

BLACKBURN (DUMBARTON) LIMITED

PROJECT ENGINEERS
DESIGNERS
SENIOR AND JUNIOR DRAUGHTSMEN

Blackburn (Dumbarton) Limited are developing new lines of business in the Structural, Mechanical and Electrical Engineering fields.

Project Engineers, Designers, and Draughtsmen with experience in Light Structures, Aircraft and Marine Servicing Equipment, Aerodrome Equipment, etc., or experience which they can adapt to these branches of Engineering are invited to apply for positions in the new Design Office.

Designers, Draughtsmen and Stressmen are also required for the Dumbarton Aircraft Design Office of Blackburn and General Aircraft, Limited, which has a long programme of work on advanced high speed jet aircraft and in the development of freighter and transport aircraft.

Excellent working conditions, contributory Pension and Free Life Assurance schemes in operation.

Applications to be addressed to:

The Personnel Manager,

BLACKBURN (DUMBARTON) LIMITED,

Castle Road,

DUMBARTON [7529

TRADAIR LTD.

Have the following vacancies for their

VIKING OPERATIONS

from

SOUTHEND AIRPORT,

PILOTS, CAPTAINS AND FIRST OFFICERS

Experienced on Viking and Type Rating an advantage.

ENGINEERS.
LICENSED AND UNLICENSED ENGINEERS.
EXPERIENCE ON VIKING ESSENTIAL.

Apply in writing, giving full details to:

TRADAIR LTD.,

SOUTHEND AIRPORT,
ESSEX. [7550

B.E.A. require Aircraft Development Engineer at London Airport for design and development of passenger and freight equipment including interior layouts, furnishings and safety equipment. Applicants must have had recognised aeronautical training, several years' experience in drawing office and knowledge of airline requirements. Salary £910-£1,085 p.a. Pension and sick pay schemes, 3 wee'ts holiday, air travel concessions. Apply to Senior Personnel Officer, Engineering, British European Airways, Engineering Base, London Airport, Hounslow, Middlesex. [7539

WORLD WIDE HELICOPTERS LTD.

require

PILOTS & ENGINEERS

for their Overseas Helicopter and Fixed-Wing operations. Prefer unmarried persons as only limited married accommodation is available. Previous helicopter experience is desired but not mandatory. Applicants must have good background of aviation experience.

Salary scales:

Pilots ... £1,020 to £2,160 per year
Engineers £960 to £1,560 per year

Accommodation, food and medical expenses provided.

Permanent position and chance of advancement with an established company for those who qualify.

Please write to:
Box No. 4049, c/o Flight.

A. V. ROE & CO. LIMITED

WEAPONS RESEARCH DIVISION

(GUIDED MISSILES)

WOODFORD, CHESHIRE

TRIALS DEPARTMENT

Applications are invited for the following positions. The work is concerned with the development of a guided weapon project:

1. ELECTRONIC TECHNICIANS

for prototype layout and assembly work, and to test and service missile components and associated monitoring equipment.

2. ELECTRONIC TECHNICIANS

to plan and calibrate missile instrumentation installations.

3. ELECTRONIC/ MECHANICAL TECHNICIANS

for installation and first line servicing work on missile monitoring equipment.

4. MECHANICAL TECHNICIANS

to develop and manufacture prototype mechanical instruments.

5. DRAUGHTSMEN

with experience in electronic layout and small scale production requirements.

Some industrial or service experience is essential for all the above posts, and applicants should preferably be of O.N.C. standard.

Apply to:

The Personnel Manager,
A. V. ROE & CO., LTD.,
Greengate, Middleton,
Manchester

quoting reference
MISC/WRD/R.88/F.

SITUATIONS VACANT

EXPANDING COMPANY

EMPLOYING 1,500, new Factory, Country District, Birmingham, requires Inspection Manager. Age between 35-42 years. Previous experience Chief Inspector Aircraft or Engine Industry. Must be A.I.D. approved and capable of controlling Inspection Staff 100 strong.

MUST be conversant with modern methods of quality control in Gas Turbine Engine Production.

SALARY according to qualifications and experience.

APPLICATIONS will be in confidence and should be addressed to

General Manager,

B.R.D. CO., LIMITED,

ALDRIDGE, STAFFS. [7509

SENIOR AERODYNAMICIST

required

for work on interesting projects.

MINIMUM qualifications—Degree or equivalent, and five years experience on general aerodynamic work.

CONTRIBUTORY Staff Pension and Life Assurance Scheme.

APPLICATIONS, giving full details of qualifications, experience, age and salary required, and quoting ref. 41/6, should be forwarded to:—

The Personnel Manager,

Hunting Aircraft, Limited,

The Airport, Luton, Beds. [7516

TECHNICAL PUBLICATIONS

WELL-KNOWN organization, still expanding in the electronic/nuclear fields, requires additional staff.

EXPERIENCED Technical Illustrators.

ELECTRONIC Circuit Draughtsmen for reproduction of diagrams for handbooks.

Irwin Technical, Ltd., 8 Breams Buildings,

London, E.C.4. Tel. Holborn 4234.

[7559

TECHNICAL Illustrator (Senior), Mech. Eng. Harrow district. Box No. 4116, or phone Harrow 3036. [7555

FIRST Officers required for Dakota aircraft for scheduled operations. Minimum qualifications British nationality, U.K. commercial licence, instrument rating and R/T licence. Box No. 4022. [7536

GLOUCESTER Railway Carriage and Wagon Company Limited requires Design Engineer with experience in stressing and design of aircraft structures to join Railway Research team.

PERMANENT Appointment.

APPLY Chief Designer. [7543

MARSHALL

AIRPORT WORKS CAMBRIDGE

SKILLED AIRFRAME FITTERS

SKILLED AERO ELECTRICIANS

required for work offering

Good Long-term Prospects on MULTI-JET AND TURBO-PROP CIVIL AIR LINERS

Overtime and Production Bonus ensure
Good Average Earnings
Single Lodgings Available

Write, call or 'phone
Cambridge 56291, Ext. 36
EMPLOYMENT OFFICER

SITUATIONS VACANT

AERO RESEARCH, LIMITED, require an Engineer for work on bonded structures, especially honeycomb sandwiches for aircraft and other applications.

THE work will consist of investigation of these structures from all aspects, both theoretical and experimental, with a view to increasing knowledge in this field and improving methods of overall and detail design.

AN attractive salary will be paid to the successful candidate, who should preferably have the following qualifications:

(1) University degree or equivalent qualification in engineering, physics or mathematics.
(2) One to three years experience in structural work.
(3) Age 22 to 30.
(4) Enthusiasm for the kind of work outlined above.

PLEASE write, stating age, qualifications and particulars of past record to the Secretary, Aero Research, Limited, Duxford, Cambridge. [7563

ENGINE air frame mechanic required, with some knowledge of electrics, but not essential, for line maintenance, on American type aircraft, at London Airport. Please write full details to Box No. 4119. [7558

AIR Traffic Control Officer required for Sywell Aerodrome, Northampton, preferably with M.T.C.A. Certificate of competency. Apply in writing, stating experience to:

THE Manager, Brooklands Aviation, Ltd., Sywell Aerodrome, Northampton. [7554

GLOUCESTER Railway Carriage and Wagon Company Limited requires Senior Designer experienced in aircraft structures for development work in connection with lightweight Railway Vehicles.

PERMANENT Appointment.

APPLY Chief Designer. [7544

VACANCIES for licensed and unlicensed aircraft engineers on light aircraft. Good prospects, single accommodation available. Apply: Wiltshire School of Flying, Ltd., Thruxton Aerodrome, Andover, Hants. Telephone Weyhill 352. [7532

OPERATIONS Assistant required by recently formed company operating from Southend Airport. Previous experience essential. Excellent opportunities for right man. Reply with full details to Box No. 4139. [7551

AIRCRAFT Inspector for Flight Shed work. Experienced in jet aircraft. Pension scheme. Fast contract transport operated from Bournemouth area to airfield. Apply in writing to Personnel Manager, Flight Refuelling Limited, Tarrant Rushton Airfield, nr. Blandford, Dorset. [7506

HELICOPTER Pilots and Engineers required for overseas operations with Bell 47 helicopters. Immediate vacancies exist for appropriately licensed personnel, but applications also invited from unlicensed personnel with sound helicopter experience. Apply in writing stating experience, licences, availability, age, married or single.

AUTAIR, LTD., 75 Wigmore Street, London, W.1. WELbeck 1131. [7528

B.B.C. requires Air Correspondent with ability to prepare at short notice concise and non-technical reports for news bulletins, to broadcast own material, and to conduct interviews (Sound and Television). Applicants should be fully trained journalists, with specialist knowledge of, and keen interest in, aeronautical affairs and developments, including rockets and missiles. They must be ready and medically fit for flying duties, if necessary outside the U.K. Salary £1,660 rising by five annual increments to £2,090 p.a. max. Requests for application forms (enclosing addressed envelope and quoting reference G.499 Ft.) should reach Appointments Officer, Broadcasting House, London, W.1, within five days. [7548

B.O.A.C. Associate Iraqi Airways require two temporary First Officers on Viscounts. Qualification type endorsement or type technical. Period six to nine months from February. Basic, accommodation, and messing allowance paid, free passages. Apply Staff Manager, B.O.A.C. Associated Companies, Stratton House, Piccadilly, London, W.1. [7541

DEVELOPMENT Engineers required for development work on fluid handling and control equipment for airborne, ground and commercial applications. Long-term projects with excellent prospects for future. Qualifications H.N.C. or equivalent. Superannuation Scheme. Fast contract transport operated from Bournemouth area to airfield. Apply in writing stating present salary to Personnel Manager, Flight Refuelling Limited, Tarrant Rushton Airfield, nr. Blandford, Dorset. [7507

NUCLEAR POWER GROUP

The de Havilland Engine Co., Ltd., offers opportunities to young men of required calibre to participate in the expansion of a Nuclear Power Team situated in the Company's London Office.

Applications are invited for the following posts:

GRADUATE PHYSICIST (age 23-28 years) holding Honours Degree in Physics, preferably with some knowledge of Nuclear Physics.

TECHNICIAN (age 25-30 years) to carry out a wide variety of calculations relating to reactors, power plants and associated equipment. A sound knowledge of thermodynamics and fluid mechanics is essential and an engineering apprenticeship is desirable.

TECHNICAL ASSISTANT to above (age 22-29 years).

Previous experience in the reactor field is desirable but not essential.

The opportunity will be given to attend Courses in Nuclear Physics and/or Technology.

Attractive salaries offered commensurate with age and ability.

Apply, quoting reference N/P.G., giving full details of age, qualifications, and experience, to:

The Personnel Officer,
THE DE HAVILLAND ENGINE COMPANY LIMITED,
ROYALTY CHAMBERS,
72 DEAN STREET, LONDON, W.1

A VACANCY arises with a light Engineering Company in the South of England, concerned with small batch production work and the manufacture of prototype aircraft components, tools, gauges, etc., for a Chief Inspector to take control of an established Inspection Department and assume responsibility for the mechanical inspection and quality control functions throughout the Company.

APPLICANTS, who should have served a recognised engineering apprenticeship, and must hold H.N.C. or equivalent—should have several years' similar executive experience. A knowledge of A.I.D. and A.R.B. procedure is considered absolutely essential, and standards room experience would be considered a distinct advantage.

THE initial salary will be commensurate with the qualifications required. The position is progressive and provides excellent opportunities for the man with a genuine interest in his work.

ALL applications, which will be treated confidentially, should contain a brief outline of career to date and be addressed to Personnel Manager, Box No. 4024. [7537

HANDLEY PAGE (READING), LTD., The Aerodrome, Woodley, Reading, have vacancies for Senior Stress Engineers, with wide practical experience, for interesting work on Civil Aircraft. High commencing salaries with new houses to rent will be offered to those appointed. Life Assurance and Superannuation Scheme in operation. Please send full particulars of experience, etc., to the Personnel Officer. [0285

SITUATIONS WANTED

P.P.L. holder, 21, desires pilot employment with training for C.P.L. on salary repayment basis. Very keen, will go anywhere. Box No. 4054. [7547

A.L.T.P. Captain, aged 37, requires position overseas. 7,500 hrs. on York and D.C.3. Reply Box No. 3918. [7511

KEEN young Pilot, C.P.L., available immediately, seeks permanent position. Instructing/photography/commercial work. Write please Box No. 4123. [7561

PILOT. 4,850 hours, 3,000 in command, age 36, U.S. citizen. U.S. Airline Transport Pilot and Flight Instructor ratings. University graduate, engineering degree. Navy, international airline and MATS training and experience on single, twin and 4-engine aircraft. Fluent French, some Spanish. Best references. Desires challenging airline or executive flying position in Europe or Asia, possibly Africa. Box No. 4036. [7538

BOOKS

ENGLAND'S only aviation bookshop. Send 3d. for 14-page catalogue or call Saturday. Beaumont, 2a Ridge Avenue, Winchmore Hill, London, N.21. [0620

"PLASTICS Progress: Papers and Discussions at British Plastics Convention 1955." The complete text and illustration of the papers (given by 29 experts) together with a full report of the discussion. Subjects include: unplasticized p.v.c.; plastics materials developments; reinforced plastics; durability and performance of plastics in service; problems in injection moulding; economics of large mouldings; new uses in industry—cables, metalization, footwear and conveyor belting. 50s. net from all booksellers. By post 51s. 9d. from Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1.

INDEX TO ADVERTISERS

	Page
Aero Research, Ltd.	4
Airscrew Co., and Jicwood, Ltd., The	31
Armstrong Whitworth Aircraft Co., Ltd., Sir W. G.	12
Automotive Products Co., Ltd.	Cover ii
B.B. Chemical Co., Ltd.	31
Birfield Industries, Ltd.	8
Blackburn and General Aircraft, Ltd.	40
Boulton Paul Aircraft, Ltd.	5
B.P. Aviation Service	26
Bristol Aero-Engines, Ltd.	Cover iv
British Air Line Pilots Association, Ltd., The	39
British Aviation Insurance Co., Ltd., The	36
British Ermeto Corporation, Ltd.	34
British European Airways	16
British Institute of Engineering Technology	40
Burnley Aircraft Products, Ltd.	32
Cellon, Ltd.	14
Central Office of Information (R.A.F.)	Between Edit. Pages 172/3
Cross Manufacturing Co. (1938), Ltd.	38, 40
De Havilland Aircraft Co., Ltd., The	33, Cover i
De Havilland Engine Co., Ltd., The	11, 17, 42
Delaney Gallay, Ltd.	28
Dunlop Rubber Co., Ltd.	25
E.M.I. Electronics, Ltd.	10
English Electric Co., Ltd., The	27, 36
Fairey Aviation Co., Ltd., The	Facing Edit. Page 172
General Electric Co., Ltd., The	37
Goodmans Industries, Ltd.	6
G.Q. Parachute Co., Ltd.	9
Harringay Photo Supplies	39
High Duty Alloys, Ltd.,	Facing Edit. Page 178
Kane, Ltd., Douglas	39
Lewis, Ltd., D.	39
London School of Air Navigation	40
Marshall's Flying School, Ltd.	39, 40, 41
Martin-Baker Aircraft Co., Ltd.	Facing Edit. Page 173
Oldham and Son, Ltd.	36
Palmer Aero Products, Ltd.	1
Power Auxiliaries, Ltd.	29
Ransome and Marles Bearing Co., Ltd.	Cover iii
Rist's Wires and Cables, Ltd.	32
Roe and Co., Ltd., A. V.	41
Rolls-Royce, Ltd.	13
Rotol, Ltd.	15
Rumbold and Co., Ltd., L. A.	37
Shackleton, Ltd., W. S.	38
Shell Aviation Service	Facing Edit. Page 179
Short Brothers and Harland, Ltd.	7
Smith Aircraft Instruments, Ltd.	18
Teddington Aircraft Controls, Ltd.	34
Texas Instruments, Ltd.	35
Uhlhorn Brothers, Ltd.	36
United Aircraft Export Corporation	2, 3
Vickers-Armstrongs (Aircraft), Ltd.	30
World Wide Helicopters, Ltd.	41

Printed in Great Britain for the Publishers, ILIFFE & SONS LTD., Dorset House, Stamford Street, London, S.E.1, by SUN PRINTERS LTD., London, and Watford, Herts. *Flight* can be obtained abroad from the following: AUSTRALIA AND NEW ZEALAND: Gordon & Gotch, Ltd. INDIA: A. H. Wheeler & Co. CANADA: The Wm. Dawson Subscription Service, Ltd., Gordon & Gotch Ltd. SOUTH AFRICA: Central News Agency, Ltd.; Wm. Dawson & Sons (S.A.), Ltd. UNITED STATES: Eastern News Co., 306 West 11th Street, New York 14

I gather Ransome & Marles have a substantial export trade?

Yes. Business overseas has been done for many years through agents and subsidiary companies. Among our biggest customers are many of the newly industrialised countries in Africa and the Far East—countries which are now equipping themselves with machinery at an enormous rate. We also export our bearings to the established industrial areas—to Europe and North America—where our products enjoy a long record of first-class service.

You have, of course, a worldwide network of agents to support this export trade?

We have indeed. Something like eighty agency offices throughout the world. We are concerned, mainly, with providing an unrivalled on-the-spot service for overseas industry. Firstly, we produce bearings that will stand up to arduous conditions of work in every climate. Secondly, local users are thoroughly informed about all the factors affecting the actual running of the bearings. Thirdly, the purchaser is safeguarded with after-sales service. These are our obligations to the foreign manufacturer. I think it is fair to say that we meet them very successfully, because we are constantly expanding our export business and shall continue to do so in the future.

RANSOME & MARLES BEARING CO. LTD • NEWARK-ON-TRENT • ENGLAND

TELEPHONE · NEWARK 456 AND TELEX 37-306

BALL & ROLLER R&M BEARINGS

FLIGHT
7 February 1958

Breguet 1001 Taon

Fiat G 91

Lockheed CL-329 Jetstar (Prototype)

Dassault Etendard VI

WORLD'S DESIGNERS SPECIFY ORPHEUS POWER

in fighters, strike aircraft, executive transports, and trainers

The Bristol Orpheus goes from strength to strength. This tough lightweight turbojet —with its simplicity of design and outstanding power-to-weight characteristics —provides designers all over the world with a unique solution to medium-thrust power plant problems.

Lightweight Bristol Orpheus turbojet dominant in increasing variety of roles

The current B Or 3 is rated at 4,850 lb and has the unparalleled thrust/weight ratio of almost 6:1. The B Or 4, the trainer version, is rated at 4,230 lb thrust; it is designed for the lowest possible fuel consumption and long life between overhauls.

Versions of the Orpheus power—or will power—the following aircraft:—

Lightweight fighters/strike aircraft

Folland Gnat	UK, INDIA, FINLAND
Fiat G 91	ITALY
Dassault Etendard VI	FRANCE
Breguet 1001 Taon	FRANCE
Hispano HA 300	SPAIN
Sud Aviation Baroudeur (alternative engine)	FRANCE
Aerfer Leone	ITALY

Utility transport

Lockheed CL-329 Jetstar (Prototype)*	US

Trainers

North American Model 249 (alternative engine)*	US
Fuji TIF 1	JAPAN
Folland Gnat Trainer	UK
Fiat G 91T	ITALY

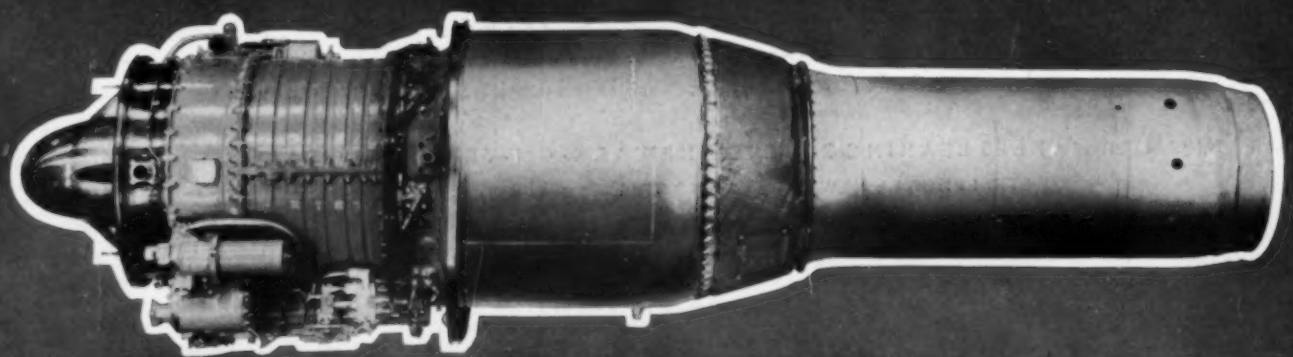
Research aircraft

Short SB-5	UK

*Production versions of the Jetstar and North American Model 249 are being offered with Curtiss-Wright TJ 37 engines. The TJ 37 is a derivative of the Orpheus, jointly developed by Bristol and Curtiss-Wright.

MOST ADVANCED TURBOJET IN ITS CLASS

Orpheus development continues. The latest version, the B Or 12, has a still higher power/weight ratio, giving 6,810 lb thrust dry, over 8,000 lb with Bristol simplified reheat.

BRISTOL
Aero-Engines

BRISTOL AERO-ENGINES LIMITED